


ILLINOIS
STATE GEOLOGICAL SURVEY





LIBRARY

ILLINOIS GEOLOGICAL
SURVEY LIBRARY



Digitized by the Internet Archive
in 2012 with funding from
University of Illinois Urbana-Champaign

<http://archive.org/details/engineeringlegal42pick>

STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION
DIVISION OF THE
STATE GEOLOGICAL SURVEY

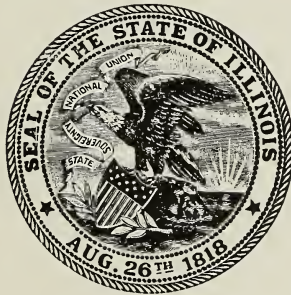
FRANK W. DE WOLF, Chief

BULLETIN No. 42

ENGINEERING AND LEGAL ASPECTS OF
LAND DRAINAGE IN ILLINOIS

by

G. W. PICKELS AND F. B. LEONARD, JR.



PRINTED BY AUTHORITY OF THE STATE OF ILLINOIS

URBANA, ILLINOIS

1921

ILLINOIS GEOLOGICAL
SURVEY LIBRARY

CONTENTS

CHAPTER	PAGE
PART I.—Status of Drainage, September, 1920: By G. W. PICKELS	
I. Introduction	9
Purpose and acknowledgments	9
Summary and conclusions	10
Discussion of the results of drainage studies	11
Organized drainage districts	11
Districts being organized	14
Overflowed areas	20
Difficulties experienced by organized districts	23
Legal	23
Engineering	24
Physical	24
Obstacles preventing new reclamation work	25
II. Mississippi River watershed	28
III. Pecatonica River watershed	45
IV. Rock River watershed	48
V. Kishwaukee River watershed	54
VI. Fox River watershed	62
VII. Desplaines River watershed	67
VIII. Lake Michigan watershed	72
IX. Kankakee River watershed	75
X. Vermilion River watershed	82
XI. Mackinaw River watershed	87
XII. Illinois River watershed	90
XIII. Green River watershed	110
XIV. Spoon River watershed	115
XV. Crooked Creek watershed	119
XVI. Salt Creek watershed	122
XVII. Sangamon River watershed	126
XVIII. Big Vermilion River watershed	135
XIX. Wabash River watershed	140
XX. Embarrass River watershed	151
XXI. Kaskaskia River watershed	160
XXII. South Fork of Sangamon River watershed	174
XXIII. Macoupin Creek watershed	179
XXIV. Little Wabash River watershed	182
XXV. Skillet Fork River watershed	189
XXVI. Big Muddy River watershed	194
XXVII. Saline River watershed	197
XXVIII. Cache River watershed	203
XXIX. Ohio River watershed	207
PART II.—Engineering Problems: By G. W. PICKELS	
XXX. Channel improvement	209
Increasing the cross-section	209
Increasing the velocity	209
Factors affecting the velocity	210
Roughness factor	210

CONTENTS

CHAPTER	PAGE
XXX. Channel improvement—continued	210
Hydraulic depth	210
Slope of stream	211
Result of channel straightening due to increased velocity.....	211
Effect of shortening channel	213
General discussion	214
XXXI. Levees	216
Design	216
Crown	216
Side slopes	216
Height	217
Freeboard	217
Cost	217
Discharge	218
Spacing and height	219
Construction	219
Maintenance	220
XXXII. Diversion ditches	222
XXXIII. Pumping plants	225
PART III.—Legal Problems: By F. B. LEONARD, JR.	
XXXIV. The drainage laws of Illinois.....	230
Foreword	230
The law of natural drainage in the absence of statute.....	230
The present statute laws: the Farm Drainage Act, the Levee Act, and miscellaneous independent acts	234
Organization	235
Adoption of plans for work and raising of money to pay for the same	243
Construction of work	249
1. Contracts for the work	249
2. Additional assessments	250
3. Change in original plans	251
Maintenance	252
Abandonment and dissolution of drainage district.....	254
Miscellaneous powers: duties and succession of commissioners...	255
Miscellaneous independent acts	261
Defects in the present law	263
Suggestions for improvement by legislation	270
XXXV. Status of the Revised Levee Act	274
Outline of the Act	274
Reprint of the Act.....	276
Cross-reference table of section numbers in the Revised Levee Act and old Levee Act.....	315
PART IV.—State Aid: By G. W. PICKELS	
XXXVI. The question of State aid.....	317
Educational assistance	319
Investigational assistance	320
Legislative assistance	322

TABLES

	PAGE
1. Table showing status of drainage in Illinois, September, 1920.....	12
2. Comparison of the several watersheds as regards amount of drainage work already done	15
3. Comparison of the several watersheds as regards new drainage districts in process of organization	18
4. Drainage data for the Mississippi River watershed	28
5. Drainage data for the Rock River watershed	48
6. Drainage data for the Kishwaukee River watershed	54
7. Drainage data for the Fox River watershed	63
8. Drainage data for the Desplaines River watershed	67
9. Drainage data for the Lake Michigan watershed.....	72
10. Drainage data for the Kankakee River watershed	75
11. Drainage data for the Vermilion River watershed	83
12. Drainage data for the Mackinaw River watershed	87
13. Drainage data for the Illinois River watershed	92
14. Drainage data for the Green River watershed	111
15. Drainage data for the Spoon River watershed	116
16. Drainage data for the Crooked Creek watershed	119
17. Drainage data for the Salt Creek watershed	122
18. Drainage data for the Sangamon River watershed	127
19. Drainage data for the Big Vermilion River watershed	136
20. Drainage data for the Wabash River watershed	140
21. Drainage data for the Embarrass River watershed	151
22. Drainage data for the Kaskaskia River watershed	161
23. Drainage data for the South Fork of the Sangamon River watershed	174
24. Drainage data for the Macoupin Creek watershed	180
25. Drainage data for the Little Wabash River watershed	183
26. Drainage data for the Skillet Fork watershed.....	190
27. Drainage data for the Big Muddy River watershed.....	195
28. Drainage data for the Saline River watershed.....	198
29. Drainage data for the Cache River watershed	204
30. Drainage data for the Ohio River watershed	208
31. Cost data for one mile of levees of different heights, using crown of 3 feet and combined side slopes of 5 to 1	217
32. Rated capacity of centrifugal pumps.....	227
33. Pumping capacity required for various sizes of watersheds.....	228
34. Cost of operating pumping plants for the years prior to 1915.....	229

MAPS

Drainage reclamation map of Illinois.....	In pocket
---	-----------

STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION
DIVISION OF THE
STATE GEOLOGICAL SURVEY

FRANK W. DE WOLF, Chief

COMMITTEE OF THE BOARD OF NATURAL RESOURCES
AND CONSERVATION

W. H. H. MILLER, *Chairman*
Director of Registration and Education

KENDRIC C. BABCOCK
Representing the President of the Uni-
versity of Illinois

ROLLIN D. SALISBURY
Geologist

ENGINEERING AND LEGAL ASPECTS OF LAND DRAINAGE IN ILLINOIS

By G. W. Pickels and F. B. Leonard, Jr.

PART I—STATUS OF DRAINAGE, SEPTEMBER, 1920

BY G. W. PICKELS

CHAPTER I—INTRODUCTION

PURPOSE AND ACKNOWLEDGMENTS

The State Geological Survey Division of the Department of Registration and Education was authorized by the 1919 legislature to make an investigation of the drainage situation throughout the State.

No specific directions were given as to just what phases of the drainage problem should be looked into and after careful consideration it was decided to study the situation under the following four headings:

1. The location and extent of the areas included in drainage districts organized under the two drainage laws of the State.
2. The location and extent of the areas being organized into districts.
3. The location and extent of the bottom lands which are now wholly or partially unproductive due to overflow conditions.
4. The difficulties which have been experienced in the organization of districts under the existing laws, and the obstacles which are holding back the reclamation of the large areas of extremely fertile lands in the river bottoms throughout the State.

G. W. Pickels, Assistant Professor of Drainage Engineering of the University of Illinois, was placed in charge of the investigation. Edmund T. Perkins of the Edmund T. Perkins Engineering Company, and John W. Alvord of the firm of Alvord and Burdick of Chicago; Jacob A. Harman of the Elliott and Harman Engineering Company of Peoria, and F. H. Newell of the University of Illinois kindly consented to act as an advisory committee. Professor C. C. Wiley and C. B. Schmeltzer of the University of Illinois, and J. A. Duck of the United States Geological Survey, assisted in the field work.

The investigation was started in July, 1919, and completed in September, 1920. Most of the field work was done during the spring and summer of 1920. The physical data obtained are shown on the accompanying map.

As a beginning, as much information as possible was obtained through correspondence. The names of the commissioners of drainage districts organized under the Levee Act and of the township clerks were secured from the county clerks. A drainage questionnaire containing twenty-one questions was sent to one or more of the commissioners of each district. Of those addressed, about 65 per cent filled out and returned the questionnaire accompanied in many instances by letters giving additional information. It was

found more difficult to obtain information concerning districts organized under the Farm Drainage Act. A record of such districts is supposed to be kept by the township clerks, but in most cases the records have been poorly kept, and in some instances they had been lost or destroyed. A standard township subdivision blank was sent to each of the 1,542 township clerks in the State, with a letter explaining the purpose of the investigation and asking them to indicate on the blank the locations of any districts in their respective townships and of any areas which were unproductive due to swamps or overflows. About 30 per cent of the township clerks responded more or less satisfactorily. In this way a considerable amount of valuable data was obtained.

With this information as a basis, each county was visited. The boundaries of districts organized under the Levee Act and of special districts formed under the Farm Drainage Act were found in the county clerk's office. The township records were also consulted for districts organized under the jurisdiction of the highway commissioners. The most valuable assistance was rendered by drainage engineers and attorneys. They were thoroughly familiar with the situation in their communities and furnished considerable data in regard to areas needing drainage, and made many valuable suggestions as to ways of improving conditions in their counties. Frequently, maps of districts were procured which were not on record, and the locations of districts in the process of formation were all obtained from these men.

The county agricultural advisors throughout the State showed a fine spirit of co-operation and gave freely of their time and of their knowledge of drainage conditions. Through interviews with drainage commissioners, land owners, bankers, real estate men, and others, the situation was studied from a variety of viewpoints.

The State Geological Survey maps and the soil maps prepared by the Agricultural Experiment Station of the University of Illinois were of great value in the determination of limits of overflow along the river bottoms. The latter maps have been used throughout this report in determining the soil types in those counties which have been surveyed.

SUMMARY AND CONCLUSIONS

For the purpose of the drainage studies, the State was divided into 28 unit areas, corresponding to 28 watersheds, and data were collected and organized for each of these areas independently. Table 1 and the accompanying map constitute a compilation of all the data, and represent in summary form the drainage status of Illinois for September, 1920. Because of information obtained after the map was printed, the data in Table 1 and in the map table differ slightly.

Summarizing in another way, the status is as follows:

1. Drainage, levee, and sanitary districts to the number of 1,043 have

been formed up to the present time. The 4,608,880 acres contained in these districts constitute 12.8 per cent of the State. About 4.3 per cent of the area within districts needs further attention.

2. One hundred and two districts are in various stages of organization. These are scattered throughout the State and contain a total of 612,050 acres, which constitutes 1.7 per cent of the State. This is exclusive of those portions of old districts which are within the boundaries of the new districts.

3. Approximately 1,126,760 acres of overflowed land lie in the river and creek bottoms. A considerable portion of this area is in timber, as the present condition of the land has not warranted its removal. On an average, crops are lost more than half the time. Over large areas, crops are not harvested oftener than once in four years. The bottom lands are the best lands in each community, and represent a valuable natural resource which is undeveloped.

4. Some 374,000 acres of wet uplands are indicated on the map. This phase of the investigation is not complete, and there are other areas which no doubt need to and will eventually be organized into districts.

The reclamation of the bottom lands of the State is a matter which should concern every citizen who has the welfare of the State at heart and wishes to see all its natural resources developed to the fullest extent. This is a resource which is inexhaustible, with proper farming, and which will add some \$50,000,000 annually to the wealth of the State.

DISCUSSION OF THE RESULTS OF DRAINAGE STUDIES

The results of the investigation will be discussed briefly under each of the four headings mentioned in the introduction above, and in conclusion a statement of the obstacles hindering new reclamation work, together with suggestions as to how they may be overcome, will be made.

1. ORGANIZED DRAINAGE DISTRICTS

The locations of 1,043 drainage, levee, and sanitary districts were obtained. These are shown in red on the map. As the total area contained in these districts is 4,608,880 acres, the average size of district is 4,420 acres.

A district was considered organized if the assessment roll had been confirmed, and if all indications were that the drainage works would be constructed.

Probably about 25 small districts are not shown owing to difficulty in obtaining their locations. The boundaries of a few of the districts are only approximate as no record of their exact boundaries could be found.

The organized districts in each watershed are numbered consecutively, beginning with number one, and correspond to similar numbers in the tables for each watershed which give the names of the districts. These tables appear in the following chapters.

About 65 per cent of these districts were organized under the Farm

TABLE 1.—Table showing status of

Watershed		Area in drainage districts			
Name	Area in square miles	Organized		Being Organized	
		No.	Total acreage	No.	Total Acreage
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
1 Mississippi.....	6,350	51	500,300	4	12,900
2 Pecatonica.....	770	0	.....	0	.....
3 Rock.....	2,270	19	145,040	1	1,400
4 Kishwaukee.....	1,200	31	128,620	3	8,400
5 Fox.....	1,630	42	91,845	5	20,020
6 Desplaines.....	1,220	24	43,190	5	32,680
7 Lake Michigan.....	780	14	300,530	5	32,060
8 Kankakee.....	2,150	101	392,360	4	17,660
9 Vermilion (into Illinois).....	1,290	36	134,240	6	54,700
10 Mackinaw.....	1,120	12	66,380	0	.....
11 Illinois.....	6,940	68	322,260	10	38,020
12 Green.....	970	23	189,090	0	.....
13 Spoon.....	1,790	1	1,500	1	4,240
14 Crooked Creek.....	1,360	0	.....	0	.....
15 Salt Creek (into Sangamon).....	1,870	27	118,770	7	42,730
16 Sangamon.....	2,340	79	320,560	6	63,180
17 Big Vermilion (into Wabash).....	1,250	63	317,860	3	7,460
18 Wabash.....	2,680	62	207,520	7	42,750
19 Embarrass.....	2,260	98	315,850	3	8,130
20 Kaskaskia.....	5,670	120	419,640	11	66,520
21 South Fork, Sangamon River.....	1,130	82	157,645	4	19,500
22 Macoupin Creek.....	970	19	31,470	3	20,110
23 Little Wabash.....	2,180	34	90,070	3	7,160
24 Skillet Fork.....	1,050	7	52,690	2	50,030
25 Big Muddy.....	2,360	0	.....	1	3,600
26 Saline.....	1,230	20	125,920	5	31,180
27 Cache.....	720	9	123,430	3	30,320
28 Ohio.....	800	1	12,100	0	.....
Total.....	56,350	1,043	4,608,880	102	614,750

drainage in Illinois, September, 1920

Area in need of drainage				Total area originally in need of drainage	Percentage still unreclaimed
Bottom lands	Uplands	Within organized districts	Total acreage		
Acreage	Acreage	Acreage			
7	8	9	10	11	12
105,700	2,600	36,000	144,300	621,500	23
32,200			32,200	32,200	100
74,300	24,000	12,000	110,300	244,740	45
8,400	24,700	4,000	37,100	170,120	22
	42,900	3,000	45,900	154,765	30
4,000	6,300	7,000	17,300	86,170	20
	4,500	5,000	9,500	337,090	3
	68,000	4,000	72,000	478,020	15
		3,000	3,000	188,940	2
	9,460	2,000	11,460	75,840	15
115,210	23,300	25,000	163,510	498,790	33
	14,700	5,000	19,700	203,790	10
30,200			30,200	35,940	84
25,180	2,000		27,180	27,180	100
20,700	7,000	2,000	29,700	189,200	16
31,500	10,880	2,000	44,380	426,120	10
	34,790	1,000	35,790	360,110	10
48,920	10,220	15,000	74,140	309,410	24
52,000	13,600	22,000	87,600	389,580	22
137,800	41,500	2,000	181,300	665,460	27
24,900	12,000	2,000	38,900	214,045	18
13,300		500	13,800	64,880	21
96,320	21,290	20,000	137,610	214,840	64
40,280		2,000	42,280	143,000	30
138,500			138,500	142,100	97
64,850		15,000	79,850	221,950	36
29,800		10,000	39,800	183,550	25
32,700			32,700	44,800	73
1,126,760	373,740	199,500	1,700,000	6,724,130	25

Drainage Act. A few are private districts organized by mutual agreement of the owners without the formality of a court order. The remaining districts were formed under the Levee Act. As a rule the river districts were organized under the Levee Act and the upland districts under the Farm Drainage Act. Generally, where the area involved was small and the plans for drainage simple, the Farm Drainage Act has been used, no doubt because of the smaller organization costs and of the saving in time. The drainage attorneys have had a good deal to do with this. Usually the local attorney has advised the use of the law with which he was most familiar.

In order that a comparison may be made of the drainage activity in the several watersheds, Table 2 has been prepared, showing the number of districts and the total area per 1,000 square miles of watershed area, and the percentage of the watershed area thus represented. This is an indication of the drainage sentiment and especially the drainage opportunity in each part of the State.

The Lake Michigan watershed ranks first due to the three large sanitary districts in this area, but if drainage districts alone were considered, this watershed would come in about twelfth place.

Naturally the watersheds containing the greatest area of flat lands, like those of the eastern and central portions of the State, rank higher than the rougher ones where the need for drainage has been smaller. The lack of natural drainage in these areas made artificial drainage imperative if the full productivity of the land was to be realized, and the fact that they lay in the corn belt enhanced their agricultural value to such an extent as to give a special incentive to drainage work.

Considering the State as a whole, 12.8 per cent is in organized districts, which represents about 68 per cent of the area subject to reclamation.

Because of watershed characteristics, column 12 of Table 1 is a better index of drainage activity than are the data in Table 2. This will be treated more fully later.

Most of the districts are located at the upper ends of the watersheds where there was little or no trouble from overflow. Here the land was so flat that rain water could not run off and stood on the ground until it evaporated or found its way slowly through the soil to the natural channels. The drainage of this land was quite simple and comparatively inexpensive as all that was necessary was the construction of a few open ditches or tile drains to provide convenient outlets for the smaller tile drains laid by the individual land owners. For the most part these districts have been successful from the start, and the land freed from excess water increased rapidly in value. However, there have been too many instances where adequate drainage was not secured due to incorrect engineering design, and the work had to be done over which doubled the cost. These failures stand as a warning to land owners that they can not afford to spend thousands of dollars for drainage

works until they are sure that their plans are correctly designed and that they will give adequate drainage to all the lands. A thoroughly competent drainage engineer is the best insurance against failure.

The drainage of the lands at the upper end of the watersheds has resulted in increased flood flows below and in decreased low-water flow during

TABLE 2.—*Comparison of the several watersheds as regards amount of drainage work already done*

Watershed		Drainage districts				
No.	Name	Area in square miles	Total acreage	Number of districts per 1,000 sq. mi. of watershed	Acres per 1,000 square miles of watershed	Percentage of watershed
1	Lake Michigan.....	780	300,530	18	385,295	60.2
2	Big Vermilion(into Wabash river)	1,250	317,860	50	254,288	39.7
3	Green.....	970	189,090	24	194,940	30.5
4	Kankakee.....	2,150	392,360	47	182,493	28.5
5	Cache.....	720	123,430	12	171,431	26.8
6	Embarrass.....	2,260	315,850	43	139,756	21.9
7	South Fork (Sangamon River)....	1,130	157,645	73	139,500	21.7
8	Sangamon.....	2,340	320,560	34	136,991	21.4
9	Kishwaukee.....	1,200	128,620	26	107,183	16.7
10	Vermilion(into Illinois River)...	1,290	134,240	28	104,062	16.3
11	Saline.....	1,230	125,920	16	102,375	16.0
12	Mississippi.....	6,350	500,300	8	78,787	12.3
13	Wabash.....	2,680	207,520	23	77,433	12.1
14	Kaskaskia.....	5,670	419,640	21	74,010	11.6
15	Rock.....	2,270	145,040	8	63,894	10.0
16	Salt Creek(into Sangamon River)	1,870	118,770	14	63,513	9.9
17	Mackinaw.....	1,120	66,380	11	59,268	9.3
18	Fox.....	1,630	91,845	26	56,346	8.8
19	Skillet Fork.....	1,050	52,690	7	50,180	7.8
20	Illinois.....	6,940	322,260	10	46,435	7.3
21	Little Wabash.....	2,180	90,070	15	41,316	6.5
22	Des Plaines.....	1,220	43,190	19	35,400	5.5
23	Macoupin Creek.....	970	31,470	20	32,440	5.1
24	Ohio.....	800	12,100	2	15,125	2.4
25	Spoon.....	1,790	1,500	1	838	0.1
26	Pecatonica.....	770	.....	.....	.....	0.0
27	Crooked Creek.....	1,360	.....	.....	.....	0.0
28	Big Muddy.....	2,360	.....	.....	.....	0.0
Total for State.....		56,350	4,608,880	19	81,790	12.8

the summer. Along the lower ends of streams, districts which at first were fairly successful are now in bad condition because of this increased flow; and although under the common law the servient tenant has to take the water which comes from the higher lands, yet the owners of the lower lands feel with some justice that the artificial drainage of thousands of square miles of uplands has placed a burden upon them which is unfair and which

was not appreciated in the early days of drainage when only small areas were involved. This will be discussed more fully later.

Most of the districts shown are still active, and periodically clean their ditches and make other necessary repairs so as to provide satisfactory tile outlets to all the lands. Some of the older districts abandoned their organization as soon as their ditches were dug, and owing to lack of maintenance the land is becoming wet again.

Unfortunately there are a few examples of large areas which formed organizations to prevent drainage. These districts did just as little as they could, and were really organized under false pretenses.

There are also instances where districts which have been organized for some time have for various reasons done no construction work. Most of these were organized just before the war and have delayed construction on account of the high cost of labor and materials. No doubt these districts will start work as soon as conditions become normal.

With a few exceptions, all of the levee districts are located along the Mississippi and Illinois Rivers. Those along the latter river are more successful than those along the former. Nearly all of the Illinois River districts operate pumping plants and practically all the land within them is producing. About six of these districts are not completed and it will be several years before the land contained in them will be fully reclaimed.

The districts along the Mississippi are protected by levees, but few of them operate pumping plants, with the result that parts of the districts can not be cultivated. For the most part, plans to remedy this situation are being made, and so it should not be a great while before all of these areas are fully reclaimed.

For these reasons, all the areas shown in red on the map do not represent thoroughly drained land. In column 9, Table 1, is given an estimate of the amount of such land in each watershed which should be included with the unreclaimed areas. It is difficult to determine the amount of these areas, but the values given are conservative. Table 1 shows a total of 4,608,880 acres in organized districts. Subtracting the total of column 9, we have 4,409,380 acres which may be considered to have been drained through organized districts.

It will be noticed that there is some overlapping of districts. This occurs where one of the districts is an old one which did not give sufficient relief to the lands on the edges, and when a new district was formed adjacent the owners of this land desired to come into it to secure a better outlet. This overlapping has been taken care of as far as the tables are concerned and no area is counted twice.

A study of the map shows that more of the bottom land along the larger streams is in districts than is the case along the smaller streams. This is owing to the greater width of the bottoms in the former case and to the

greater area protected by a levee of given length and the smaller cost per acre. The problem along the smaller streams is much more complicated from both an engineering and organization standpoint.

Although the total area of land in districts is large, it must be remembered that for the most part this area was the easiest and cheapest to reclaim and that the remaining wet areas will be drained much more slowly due to increased difficulties and greater expense.

No effort was made to determine the cost of each district, and hence the average cost per acre of reclaiming this land can not be stated. Naturally, a considerable amount of such data was obtained; but because of the difference in size of the districts and in the amount of drainage construction which was necessary, the cost per acre varied greatly—from a few dollars in some instances to as much as \$50 in others. There are comparatively few districts which have not paid good returns on the money invested. Those which have not done so were either poorly planned or improperly constructed. The costs have sometimes been greatly increased by long litigation, with the attendant court costs and attorneys' fees. However, most of this trouble could have been avoided by careful planning, and the additional cost should not be charged to drainage reclamation.

2. DISTRICTS BEING ORGANIZED

One hundred and two districts are shown on the map as being in the process of organization. Some of these are having preliminary surveys made; others are circulating their petitions; and still others have been organized by court order, and commissioners have been appointed but the assessment roll has not been confirmed. The critical point in the organization of a district is this confirmation, for when the amount which each land owner is to pay is definitely known, many objections arise, and many districts have failed at this stage. Therefore, this has been taken as the line of demarcation between organized districts and those in process of organization.

The total area of lands under this classification is 681,600 acres, exclusive of areas common to both old and new districts except in the case of outlet districts which are included. That the average size of each district—6,682 acres—is 51 per cent greater than the average of those already formed, indicates a tendency towards drainage work on a more comprehensive scale.

About 60 per cent of the new districts will be organized under the Levee Act, which includes practically all of the large ones. There seems to be a growing sentiment among drainage attorneys in favor of this act. Both of the drainage laws have been so amended from time to time that there is now very little difference between them. The fact that under the Levee Act all proceedings are under the jurisdiction of the County Court and that the records are more accessible and better kept is largely responsible for the increased use of it.

TABLE 3.—*Comparison of the several watersheds as regards new drainage districts in process of organization*

Watershed		Drainage districts				
No.	Name	Area in square miles	Number	Total acreage	Acres per 1,000 square miles of watershed	Percentage of watershed
1	Skillet Fork.....	1,050	2	83,030	79,076	12.3
2	Vermilion(into Illinois River)...	1,290	6	54,700	42,403	6.6
3	Cache.....	720	3	30,320	42,111	6.6
4	Lake Michigan.....	780	5	32,060	41,103	6.4
5	Sangamon.....	2,340	6	63,180	27,000	4.2
6	Des Plaines.....	1,220	5	32,680	26,787	4.2
7	Saline.....	1,230	5	31,180	25,350	4.0
8	Salt Creek(into Sangamon River)	1,870	7	42,730	22,850	3.6
9	Macoupin Creek.....	970	3	20,110	20,730	3.2
10	Kaskaskia.....	5,670	11	103,070	18,178	2.8
11	South Fork, Sangamon River....	1,130	4	19,500	17,256	2.7
12	Wabash.....	2,680	7	42,750	15,950	2.5
13	Fox.....	1,630	5	20,020	12,282	1.9
14	Kankakee.....	2,150	4	17,660	8,214	1.3
15	Kishwaukee.....	1,200	3	8,400	7,000	1.1
16	Big Vermilion(into Wabash River)	1,250	3	7,460	5,968	0.9
17	Illinois.....	6,940	10	38,020	5,478	0.9
18	Embarrass.....	2,260	3	8,130	3,597	0.6
19	Little Wabash.....	2,180	3	7,160	3,284	0.5
20	Spoon.....	1,790	1	4,240	2,368	0.4
21	Mississippi.....	6,350	4	12,900	2,032	0.3
22	Big Muddy.....	2,360	1	3,600	1,525	0.2
23	Rock.....	2,270	1	1,400	617	0.1
24	Mackinaw.....	1,120	0	.....	.....	0.0
25	Green.....	970	0	.....	.....	0.0
26	Pecatonica.....	770	0	.....	.....	0.0
27	Crooked Creek.....	1,360	0	.....	.....	0.0
28	Ohio.....	800	0	.....	.....	0.0
	State.....	56,350	102	684,300	12,145	1.9

For convenience Table 3 has been prepared from Table 1, and the watersheds arranged in the order of their present activity based on the number of acres per 1,000 square miles of watershed which are contained in the new projects. It will be observed in Table 3 that the total acreage for the Kaskaskia and the Skillet Fork watersheds is larger than that given in Table 1. This is due to the large outlet districts in those watersheds which include a large acreage of land in organized districts. Since these organized districts are now inadequately drained, and since they will receive almost as much benefit from the outlet districts as the land outside, they have been included in the total acreage. It is encouraging to note that work is being planned in twenty-three watersheds. The number of districts in the several areas is fairly uniform, and the percentage of each watershed embraced in new work

varies from 12.3 per cent for the Skillet Fork to 0.1 per cent for the Rock. The combined areas represent 1.9 per cent of the State. This added to the 12.8 per cent within organized districts gives 14.7 per cent of the State which has either been reclaimed or for which plans are being made. As less than 20 per cent of the State was ever in need of artificial drainage, it is apparent that more than two-thirds of the work of complete reclamation has been, or is about to be accomplished.

Two of the districts are especially worthy of mention, not because of their size alone, but because they are Outlet Drainage Districts organizing under Section 65a of the Levee Act which was passed by the Forty-ninth General Assembly. This amendment is undoubtedly the most important drainage legislation which has been made in recent years.

The Okaw Valley Outlet Drainage District (No. 124, Kaskaskia Watershed, on map) will contain approximately 70,000 acres and proposes to cut an entirely new channel for the Kaskaskia River from a point about three miles south of the Shelby-Fayette county line to the Baltimore and Ohio Railroad bridge at Carlyle. The size of the new channel will vary from a 50-ft. bottom width at the upper end to a 120-ft. bottom width at the lower. The purpose of this work is to enable the flood water to run off as quickly as possible and thus reduce the high water stage and overflow period of the stream. While this improvement will not prevent all flooding of the land, it will undoubtedly eliminate the minor floods which have done so much damage in the past to the lands outside of levee districts. The preliminary estimate of this improvement is \$30 an acre.

The Skillet Fork Outlet Union Drainage District (No. 8 on map) will contain 78,000 acres and is being organized to straighten the Skillet Fork River from Wayne City, Wayne County, to the junction of that stream with the Little Wabash in White County. The plans call for a channel with a bottom width of 80 feet at the upper end and 120 feet at the lower end. This improvement will serve the same purpose as that mentioned for the Okaw Outlet District.

Both of these districts contain lands which are already in organized districts. The Okaw Outlet District includes eight districts with a total area of 36,000 acres, and the Skillet Fork Outlet District contains three old districts covering 38,000 acres. The existing districts have taken the leading part in the promotion of these new enterprises in order to provide satisfactory outlets for their own ditches, and to lower the high water stage during floods.

The North Vermilion District (No. 40), Livingston County, is another large district having in view the straightening of the Vermilion River. It will contain 37,220 acres and will provide a much needed outlet to the districts above.

There are some six or eight other districts containing from 8,000 to 10,000 acres which are located along the smaller streams.

There is an unusual amount of interest being taken in drainage reclamation at present owing to the increased value of farming land, and areas which heretofore have not been considered feasible drainage projects are being studied with reclamation in view.

3. OVERFLOWED AREAS

The location and extent of the overflowed areas are indicated on the map and the amount of such land for each watershed is given in Table 1, column 7. The total for the State is 1,126,760 acres which represents 3.1 per cent of its entire area.

The damage from overflow varies; but in all cases the losses warrant the formation of drainage districts for improving conditions. On the average, crops are lost at least half the time, and along the larger streams crops are rarely harvested oftener than once in four years. A large part of the bottoms is still in timber; and there are many owners who have given up trying to farm the bottom land even where the timber has been removed. Lands which at one time raised crops often enough to pay for farming them, are now idle because of increased floods due to the thousands of square miles at the heads of the watersheds which have been organized into districts. Frequently, certain rivers get out of their banks in the middle and lower reaches when there is no rain at all locally, but heavy storms at the upper end of the watersheds. It is this condition of affairs which makes the owners of this land feel that the upper owners or the State should help them in correcting these conditions.

The bottoms contain the most fertile lands in their respective communities, since the soil is the cream of the upland soil which has been washed down and deposited there. These lands are consequently the richest agricultural lands in the State and constitute an extremely valuable undeveloped natural resource.

The overflowed areas on the map have been carried upstream till the width was approximately one-fourth mile. It has usually been considered that the bottoms should be at least one-half mile wide in order to make any drainage investment profitable. But judging from successful districts already constructed, it is evident that a certain amount of channel correction pays even for the narrower areas.

Along some of the streams there are small pockets here and there which are not shown on the map as they are too small for anything but private reclamation.

In Lake and Winnebago counties there is a large amount of lands along the Fox River which has been classified as wet uplands rather than as overflowed lands, although a certain percentage might be considered as such.

Practically all the bottom areas along the Green River have been formed into districts, and in this respect this watershed leads all the others.

The Kankakee, Big Vermilion, Vermilion, and Mackinaw watersheds have no remaining overflowed areas of consequence and no such areas are included in this report.

All the other watersheds contain overflowed lands ranging in amount from 4,000 to 138,500 acres. The Pecatonica, Crooked Creek, and Big Muddy watersheds are 100 per cent unreclaimed; while the Spoon is practically so, having but one small district.

As mentioned earlier in this report, the reclamation of the bottom lands is much more complicated than is that of the uplands, due to the need for protection against a larger amount of flood waters. The areas along the Mississippi, Illinois, Ohio, and Wabash rivers are more or less concentrated and the problem is confined to the building of levees to keep out the river water, the construction of diversion ditches for the hill waters and of interior ditches for collecting the rain water, and the installation of pumping plants for removing the latter water from the district. These river channels are much larger and straighter and therefore better able to carry the flood waters than are the smaller interior streams. The latter streams have very little fall and wind from one side of the flood plain to the other, their crookedness complicating the problem considerably.

In the past, districts have been scattered at random along the streams, each one working independently and with no thought as to the effect its plans might have on the lands above and below. Where levees have been built, they have as a rule been placed too close to the stream, to the detriment of the lands on the opposite side; and where levees have been built on both sides, sufficient floodways have not been left, with disastrous results to the levees themselves or to the lands above. In other words, there has been no coordination and it has been a case of each district for itself. Also no attempt has been made to get at the root of the trouble and to reduce the flood heights in the streams.

It is now realized that the overflowed land cannot be reclaimed in this way. There is one problem which is common to all the bottom lands in each valley, namely, that of removing all obstacles to the flow of the stream, so that the water can get away and not be held in storage for days or even weeks at a time. This means straightening and cleaning the streams as much as is economically possible so as to make the distance which the water has to travel less and to reduce the friction between the flowing water and the banks and beds of the stream.

The majority of the land owners recognize channel correction as the first step, and a number of districts are being held back because the experience of others has taught the uselessness of building either ditches or levees until the channel itself is improved.

Hence each stream presents one and the same reclamation problem. Each must be *studied as a unit* and by disinterested parties. The land owners could rarely agree as to what changes should be made in the channel because of the effect which such changes might have on their individual lands. It is because of this, that the more progressive land owners are urging the State to assist them in organizing, financing, and constructing such improvements. These men have recently organized the Illinois Drainage and Rivers Improvement Association which has for its objects, (1) the dissemination of information regarding the vast natural resources that are being absolutely wasted by allowing the productivity of the million and more acres of bottom lands to be destroyed by floods which are preventable with intelligent and concerted action; and (2) the adopting of laws giving State aid to outlet drainage projects through a State Department, all preliminary expenses to be borne by the State, the cost of construction to be underwritten by the State, and reimbursement to be made by the land owners concerned when the reclaimed areas are producing.

The point has been reached where the reclamation of the bottom lands must be done on a more comprehensive scale than was necessary in the case of the uplands. It was to make such work possible that the 1917 Legislature added Section 65a to the drainage law, and as previously stated the middle Kaskaskia valley and the lower Skillet Fork valley are organizing under this provision to provide the best possible outlet for the flood waters. However, the Kaskaskia improvement stops at Carlyle, about midway of the stream, and the flood stages here will be much higher than ever before and the land at the lower end of the new district will suffer from backwater.

In the following chapters, the conditions in each watershed are discussed in more detail.

It was not the purpose of this investigation to locate all the upland areas which needed more drainage; but in the course of the work, certain such areas were specifically mentioned and it was decided to show them on the map and list them in the tables. It must be understood distinctly that this is only a *partial list of such areas*. Undoubtedly other areas, just as much in need of drainage as those shown, have been omitted. The organization of districts in such locations will change the values and percentages in the tables. The total amount of the wet areas indicated is 373,340 acres which is approximately 1 per cent of the State.

The colored areas on the map, taken together, constitute 18.6 per cent of the State. This may be considered the drainage opportunity. Although 14.5 per cent either has been or is being cared for, leaving 4.1 per cent to be reclaimed, it must not be assumed that it is a matter of only a short time until the reclamation of the State will be completed, for from now on the work will progress much more slowly, unless the State decides to take a hand in the matter and speed up the work.

DIFFICULTIES EXPERIENCED BY ORGANIZED DISTRICTS

LEGAL

Most of the trouble which districts have had has been of a legal nature. From the time the swamp and overflowed land came into the possession of the State as a gift from the Federal Government, the State Legislatures have tried through the enactment of laws to make it possible for those who bought the land to reclaim it. Since there was no provision in the State Constitution for the enactment of drainage laws, and since the construction of ditches or drains across lands without the consent of their owners was contrary to the common law, the drainage acts of the General Assemblies up to 1870 were declared unconstitutional. In that year and again in 1878, the Constitution was revised and a drainage provision included, under which in 1879 two distinct and independent drainage acts were passed, commonly known as the Levee Act and the Farm Drainage Act. The placing of both of these Acts on the statute books was a serious mistake to which has been due most of the trouble districts have had. Since 1879, each General Assembly has passed several amendments to these Acts, whereby the organization of drainage districts might be more readily carried out; in all, 114 such amendments have been passed.

In view of all the time and effort that have been expended on them, it would seem that the drainage laws would be thoroughly satisfactory; but as a matter of fact drainage districts have been organized under the greatest legal difficulties. However, this condition of affairs cannot justly be charged to the State; and the blame must be borne in large part by those who desired legislation but did not know definitely what they wanted. Too many amendments have been passed to meet certain local situations without a careful study as to the effect they might have on the State as a whole. The result of this patching process is that our drainage laws are very complex, and are inadequate to meet present needs.

Since the two Acts were passed, they have been construed numerous times by the Supreme Court, and in some decisions it is not clear as to which Act is being considered. This has added to the confusion.

No legal difficulties have arisen where practically all the owners have been in favor of drainage, as in these cases there were no objectors to pick flaws in the form of petition, court procedure, etc. Fortunately this has been true for a great many districts, especially the small ones.

Where large areas have been involved, naturally there has been more or less opposition. Many districts have had years of litigation before they were finally organized, and some have failed in the effort. There are examples of districts which have spent almost as much in court costs and attorney fees as in digging ditches.

ENGINEERING

Drainage commissioners have not always appreciated the importance of correct engineering design, nor have they always chosen competent engineers to plan their works. Too often, surveyors who have not been fitted by training or experience for drainage work, have been appointed to design drainage systems. Many districts have learned to their cost that good engineering is the best insurance against failure. Also, some engineers and commissioners have been guilty of the practice of making their estimates much too low in order to avoid opposition, and then making additional assessments to complete the work. This procedure has naturally resulted in much unsatisfactory work and has reacted against drainage reclamation.

The engineering profession is largely to blame for this state of affairs. In the past, engineers have not considered drainage work as worthy of their attention and have been content to leave all of this practice to local surveyors. Our universities have taken the same attitude, and it is only in the last few years that our own State University has given any instruction along drainage and flood protection lines. Today, however, many of the best known engineers in the country are engaged in work of this kind, and there is no reason why there should be any more difficulty from this source.

PHYSICAL

Many districts are in need of better outlets, which can only be secured through the improvement of the outlet stream into which they empty. Examples are to be found in nearly every watershed. The Vermilion District, located in Iroquois, Ford, and Livingston counties, is one of these. Here is a district of 38,000 acres which is one of the best in the State, yet the Vermilion River into which it flows is smaller than the main ditch of this district. The North Vermilion district is now being organized to remedy this condition. Along the Embarrass, Little Wabash, Kaskaskia, Saline, and other rivers there are districts which will never be entirely successful till the streams themselves are improved.

Much trouble is experienced along the Illinois River because of the Chicago Sanitary District, which the land owners claim has raised the water level about four feet. Because of this some of the districts have had to strengthen their levees, and thousands of acres of the best agricultural lands which were formerly farmed are now idle.

The Kankakee watershed was originally one of the wettest in the State. The map shows the large amount of drainage work which has been done, and now there are few swampy areas remaining. Conditions were especially bad above Momence, due to the rock ledge in the bottom of the river. Some years ago this natural dam was lowered about two feet with great benefit to the surrounding country. Most of this territory is now farmed, but the ground water is still too near the surface for the best growth of crops, and

there is further demand for improvement by again lowering the bed of the stream at this point. The rock bottom extends for about two miles, and the river is about 300 feet wide, which makes the undertaking a costly one. The Kankakee River is the outlet of a large area in Indiana which would also be benefited by this improvement and some cooperative agreement might be arranged between the two states for carrying out this project, if after investigation it is found that the additional flow of water down the Kankakee River would not be detrimental to the Illinois waterway now under construction.

Along a number of streams dams have been built, for milling purposes usually, though in the case of the Illinois River, navigation was the principal object. These mill dams are causing the flooding of large areas and should be removed, where they have ceased to fulfill the function for which they were constructed. As regards the Illinois River dams, complaints have been made of their existence in the belief that they have contributed to flood conditions. However the Division of Waterways is of the opinion that it would be against the interest of navigation to remove these dams until the controversy with the Government is settled, relative to the amount of water to be diverted from Lake Michigan. Should the present flow be curtailed materially, it would be impossible for boats to navigate the Illinois River during several months of the dry summer season if the dams were removed.

OBSTACLES PREVENTING NEW RECLAMATION WORK

Ignorance on the part of a large proportion of the land owners as to the engineering and economic features of drainage is without doubt the main obstacle in the reclamation of the bottom lands of the State. They believe that the expenditure will ruin them instead of being an excellent investment. They are standing in their own light, and should be made to see that they are losing money every year that they defer reclamation and allow such land to remain unproductive.

Section 44 of the drainage law as amended by the 50th General Assembly is proving a serious drawback in the northeastern corner of the State. Under this amendment, a district which has been fully organized by the court, and which has incurred obligations in the way of engineers', attorneys' and commissioners' fees, can abandon the district at any time before construction contracts are let by the payment of court costs only, which does not include the above mentioned fees. Several districts have availed themselves of this law and abandoned their organization. While it is only right that districts should be allowed to dissolve if so minded, it is also right that they should be made to pay all obligations incurred, and certainly the legislature must have intended "court costs" to cover all expenses. However, the courts have decided otherwise, and certain engineers and attorneys have lost all the time and money which they have spent in behalf of these districts. With this

in mind, few engineers and attorneys will undertake drainage work unless their remuneration is assured from the petitioners individually, and few land owners will be willing to assume this responsibility.

Other amendments have been passed to meet the needs of individual districts which have worked hardships on those in other parts of the State. In fact the drainage laws should be revised; those provisions which have stood the test of time should be retained, those which are confusing or contradictory should be clarified or omitted, and those which are a menace should be eliminated.

Most of the reclaimable areas are located in the river and creek bottoms. As previously stated the better informed land owners are beginning to see the uselessness of piece-meal reclamation. Here flood prevention is the first step, flood protection the second, and drainage third. The last mentioned can be handled through local districts, but the first and possibly the second are problems common to entire valleys. Flood conditions should be prevented or rather reduced as much as possible through channel corrections; certain portions of the valleys will require levees to completely protect the bottom lands.

The forming, by the petition method, of an outlet district embracing an entire stream extending through several counties, is an undertaking which might well discourage the most ardent drainage enthusiast. Though the majority are in favor of doing something to better conditions, they naturally have diverse opinions as to just what that should be. Here, as elsewhere, there are those who are against improvements of all kinds and would oppose the project throughout. Even before the petition could be prepared, extensive surveys would have to be made and plans drawn up indicating in a general way at least the nature of the improvement. This involves a considerable initial expense which would have to be borne by someone. The circulating of the petition requires a large amount of time, patience, and effort. Then there are the legal expenses incident to organization which would have to be guaranteed by the promoters in case the district failed to materialize. These expenses would be unusually heavy, for in a district of this size the objectors would no doubt carry their fight to the Supreme Court. For these reasons the reclamation of the bottom lands will in all probability proceed slowly unless the State decides to coöperate in the undertaking. Such coöperation might be along some of the following lines:

1. An educational campaign might be conducted through the Department of Registration and Education for the purpose of explaining the engineering, financial, economic, and other phases of reclamation, thereby bringing about better coöperation among the owners themselves.

2. Topographic surveys and maps might be made for those river valleys which have not already been mapped. Since the State is engaged in the systematic survey of all the lands within its boundaries, it would seem

an easy matter to hasten the mapping of the river valleys so that such maps might be available for planning drainage improvements, and thus save duplication of effort and expense.

3. The carrying out of the scientific engineering studies necessary to determine the amount and rate of runoff in the several watersheds would be of the greatest value, since reclamation plans can not be intelligently made without this information. Undoubtedly the coöperation of the U. S. Geological Survey and the Drainage Investigations Division of the U. S. Department of Agriculture could be secured in connection with such studies.

4. The drainage laws should by all means be simplified, so that the required majority of land owners in any community who desire to improve their lands by a system of combined drainage should be able to do so without unnecessary delay and expense.

5. A special provision might be made in the law, applicable to bottom lands. This should be somewhat similar to Section 65a of the Levee Act. But the *petition method* of getting the project into court should be improved upon, so as to make this step in the procedure of organization less difficult of accomplishment.

6. A Division in one of the State Departments for advising with drainage commissioners and engineers would be of the greatest value. The approval of drainage plans should not be compulsory, and would not need to be so to accomplish the desired results.

7. Assistance in financing the larger projects, so that the land owners would not be burdened with assessments till the land was producing, might also be given serious consideration.

The reclamation of the bottom lands will result in the improvement of the highways and in the educational, social, and industrial development of these portions of the State. Entire communities will be benefited more or less directly as well as the owners of the overflowed lands. The increase in the value of property will add to the revenue of the counties and State, and for this reason, if for no other, the reclamation of these lands should receive the careful consideration of the county and State authorities.

CHAPTER II—MISSISSIPPI RIVER WATERSHED

This watershed extends the entire length of the State, and, as considered in this report, contains 6,350 square miles of territory in Illinois. Fifty-one drainage and levee districts, embracing 500,300 acres, have been formed, and four such districts are now in process of organization, which, if effected, will add 129,000 acres to the above total.

Some 105,700 acres of bottom land remain to be reclaimed in this

TABLE 4.—*Drainage data for the Mississippi River watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Savanna and York.....	Carroll	3,400
2	Johnson Creek Levee and Drainage.....	Whiteside-Carroll	3,300
3	Cattail.....	Whiteside	6,210
4	Summit.....	Whiteside	1,240
5	Meredosia L. and D.....	Whiteside-Rock Island	8,300
6	Hampton No. 1.....	Rock Island	2,000
7	North Edwards Special.....	Henry	5,000
8	Edwards River.....	Mercer	2,800
9	Drury.....	Rock Island	5,300
10	Union No. 1.....	Rock Island-Mercer	5,270
11	Bay Island D. and L. No. 1.....	Mercer	18,300
12	Keithsburg.....	Mercer	1,500
13	Henderson County No. 3.....	Henderson	2,300
14	Henderson County No. 1.....	Henderson	9,120
15	Henderson County No. 2.....	Henderson	7,620
16	Niota.....	Hancock	1,000
17	Hunt D. and L.....	Hancock	16,000
18	Lima Lake D. and L.....	Adams	13,480
19	Indian Grave D. and L.....	Adams	19,000
20	South Quincy D. and L.....	Adams	5,590
21	Fall Creek.....	Adams-Pike	3,000
22	Sny Island D. and L.....	Adams-Pike	110,000
23	Cahokia Creek D. and L.....	Madison	4,000
24	Wood River D. and L.....	Madison	4,390
25	Indian Creek Mutual (Private).....	Madison	600
26	Chouteau Island D. and L.....	Madison	2,360
27	Chouteau, Nameoki and Venice D. and L. (Out- side of No. 29).....	Madison	4,900
28	County Ditch D. and L. (Outside of No. 29).....	Madison	2,400
29	East Side Levee and Sanitary District.....	Madison-St. Clair	65,860
30	Canteen Creek.....	Madison-St. Clair	1,640
31	Falling Springs.....	St. Clair	920
32	Prairie du Pont D. and L.....	St. Clair	5,700
33	Wilson and Wecker D. and L. No. 6.....	Monroe	1,600
34	Columbia D. and L. No. 3.....	Monroe	13,500
35	Harrisonville and Ivy Landing D. and L. No. 2....	Monroe	10,000
36	Moredock and Ivy Landing No. 1.....	Monroe	16,700
37	Fort Chartres and Ivy Landing D. and L. No. 5....	Monroe	10,500
38	Stringtown and Ft. Chartres Levee No. 4.....	Monroe-Randolph	3,200

TABLE 4.—*Drainage data for the Mississippi River watershed—Concluded*

Reference No.	Name of district	County	Area
			<i>Acres</i>
39	Marias Giteau D. and L.....	Randolph	520
40	Edgar Lakes D. and L.....	Randolph	2,000
41	Kaskaskia Island.....	Randolph	10,000
42	Degonia and Fountain Bluff D. and L.....	Jackson	29,260
43	Jones Pond Mutual (Included in D. and F. B. Dist.)	Jackson	.....
44	Boones Pond (Included in D. and F. B. Dist.).....	Jackson	.....
45	Big Lake Special.....	Jackson	4,500
46	Grand Tower Drainage and Levee.....	Jackson	2,620
47	Preston D. and L.....	Union	16,200
48	Miller Pond D. and L.....	Union	4,300
49	Clear Creek D. and L.....	Union	19,130
50	East Cape Girardeau and Clear Creek D. and L....	Alexander	9,370
51	North Alexander D. and L.....	Alexander	4,400
	Total.....		500,300

Districts being organized

52	Washington Township.....	Carroll	2,000
53	Along Henderson River.....	Henderson	5,000
54	Long Island D. and L.....	Adams	5,000
55	East Wood River D. and L.....	Madison	900
	Total		12,900

Overflowed areas

56	Along Mississippi North of Savanna.....	Jo Daviess-Carroll	14,000
57	Along Mississippi South of Savanna.....	Carroll-Whiteside	13,000
58	Along Mississippi South of Rock Island.....	Rock Island	4,500
59	Along Edwards River.....	Henry	2,700
60	Along Edwards River.....	Mercer	7,000
61	Along Henderson River.....	Warren-Henderson	14,500
62	Along Cahokia Creek.....	Madison-Macoupin	6,000
63	Along Mississippi River South of Wood R.	Madison	4,000
64	South of Wilson and Wecker D. and L.....	Monroe	2,500
65	Along Mississippi River.....	Randolph	13,000
66	Area around Kaskaskia Island District.....	Randolph	2,500
67	Along Marys River.....	Randolph	6,000
68	South of Olive Branch.....	Alexander	16,000
	Total.....		105,700

Up'land areas needing drainage

69	Northeast of Keithsburg.....	Mercer	2,600
----	------------------------------	--------	-------

watershed. Table 4 gives the name, size, and reference number of each district. The number refers to the map which accompanies this report.

^aTotal area is 16,050 acres, 11,550 acres in Degonia and Fountain Bluff District.

A more detailed description of the drainage work which has been done and of that which remains to be done will be taken up, commencing at the northern end of the watershed.

Practically all of Jo Daviess County drains into the Mississippi River. This county is the highest in the State and its topography is rough in detail. Nearly every square mile has a relief of more than 100 feet, so there is no need for artificial drainage. In the southwestern corner of the county, and extending into Carroll County, there are 14,000 acres of river bottom land which are subject to overflow. However, this soil is very sandy and has a low agricultural value; and it is doubtful whether its reclamation is worth while, at least at the present time. This area is now being used as a proving ground of the Ordnance Department of the U. S. Army.

The northwestern two-thirds of Carroll County is in this watershed. Above Savanna, the flood plain along the river is low and narrow, except in the northwestern corner of the county. Here a tract of some 2,000 acres was incorporated under the Farm Drainage Act into Washington Township Drainage District No. 1. The plans called for the construction of levees and the installation of a pumping plant. The first assessment had been made, when the objectors went into court and defeated the assessment on the grounds of faulty organization. An attempt is now being made to organize this area under the Levee Act.

Between Savanna and Fulton, the flood plain on the east of the river is from one to two miles in width and contains about 13,000 acres of reclaimable land. East of this area, the second bottoms form a sand ridge from ten to twenty feet high and a mile or more in width. Between this ridge and the bluffs there were two large swampy areas which have been incorporated into the Savanna and York and the Johnson Creek districts.

The Savanna and York District, organized in 1906, contains 3,400 acres. The upper end of this district is about three miles southeast of Savanna. The drainage works constructed consist of five miles of open main ditch, with an outlet in Plum River at the northern end of the district. A small creek, which empties into the upper end of the ditch, brings down so much sand from the hills and deposits it in the ditch that it is impossible to keep the channel open. To overcome this difficulty, two 30-inch pumps are used to raise the water of the district over the bar thus formed. Considerable opposition was met with in the organization of this district through the influence of duck clubs. The success of this district is evidenced by the fact that the land, which in its original state was worth not over \$10 an acre, is now valued at \$250 an acre.

The Johnson Creek Drainage and Levee District was organized

in 1908 to reclaim 3,300 acres of swampy land, partly covered by a lake, which was fed by Johnson Creek from the northeast. About 600 acres within the district are too wet to cultivate. Also there are some lands outside of the district which should be annexed. The Commissioners are now trying to organize a sub-district, but are meeting with strong opposition.

To the south of the Johnson Creek District and just east of Fulton, is the Cattail District which was organized in 1908 for the purpose of reclaiming 6,210 acres at the entrance to Cattail Valley, which was formed by some pre-glacial stream. The remainder of the land in this valley, which now drains to the north, is in the Summit Drainage District. There are only 1,240 acres in this district. Both of these projects have accomplished their purpose to the satisfaction of the land owners.

Meredosia Valley, which lies between the Garden Plain and the Coe Uplands, is drained through the Meredosia ditch, which is the boundary line between Whiteside and Rock Island counties. The Meredosia Levee and Drainage District has constructed two and one-half miles of levee at the upper end of the district and about ten miles of open ditch. Three bond issues have been made since the district was organized in 1895. About \$75,000 have been invested in a pumping station and equipment which consists of a 30- and a 36-inch centrifugal pump driven by steam. It is necessary to operate the pumps for about four months during the year. The market value of the land ranges from \$100 to \$200 an acre. Just south of Watertown and at the western end of Pleasant Valley, the Hampton Township Drainage District No. 1 is located. The remaining districts in this valley have their outlets in the Rock River and are treated under that watershed.

Along the Mississippi below the mouth of Rock River, there is an area of 4,500 acres of overflowed land which, though a continuation of the overflowed area along the Rock River, has been listed in the Mississippi watershed. However, all of these lands should be treated as a unit in any plans for reclamation.

For a distance of about 20 miles below the mouth of the Rock River, the Mississippi Valley is narrow and contains no areas of overflowed lands large enough to pay for their reclamation. South of the big bend in the river, however, the valley widens and the flood plain has been protected from overflow by a levee about 18 miles in length. Three districts are organized in this area.

The Drury Drainage and Levee District, 5,300 acres, was organized in 1909, and extends to Copper Creek on the south. The land is extremely fertile and the investment has been very profitable to the land owners. The levee broke in 1916 and the crops were destroyed. The break was repaired and the entire levee strengthened.

On the south side of Copper Creek, Union District No. 1 of Rock Island and Mercer counties begins. There are 5,270 acres in this district. The levee broke in the spring of 1920 and not only were the crops lost, but the lives of the inhabitants were endangered. Some 125 families had to move to higher ground with loss of personal goods. Although the breaks have been repaired, the entire levee system needs strengthening.

The Bay Island Drainage and Levee District, 18,300 acres, is at the south end of the group. About 15 miles of levee and 20 miles of ditch have been constructed since the district was organized in 1907. The construction of a levee on the Iowa side of the river has caused the high-water stage to be increased, and the levees of the Bay Island District should be raised and strengthened. More tile drainage is needed in this district. The value of the land has increased from \$20 an acre in 1907 to \$150 in 1920.

Edwards River empties into the Mississippi above Keithsburg, and drains the northern half of Mercer County and the southern portion of Henry County. At the eastern end of this watershed in Henry County, the North Edwards Special District, containing 5,000 acres, was organized in 1880. The district lies along the river and is about one mile in width. The river was dredged for a distance of about 11 miles. The project has been a success and the commissioners place a value of \$300 on the land. From the western end of the North Edwards District to the Henry-Mercer County line, the bottom land is subject to overflow. There are about 2,700 acres actually overflowed and probably as much more would be benefited by the dredging and straightening of the stream.

The river was improved some years ago for about four miles in the eastern portion of Mercer County. An attempt was made to organize this area into the Edwards River District, but opposition was encountered, so no legal organization was effected. However the more progressive owners succeeded in improving the worst places in the stream which made it possible to cultivate the land right up to the banks. The land is still overflowed during flood periods but, due to improved channel, the water does not remain very long. From the village of Cable to the Mississippi, Edwards River overflows its valley for a width of from one-half to one mile and damages about 7,000 acres of land. At the Rock Island Southern Railway's power house just below Matherville, a dam was once constructed to impound water for the boilers of the power plant. This power plant is no longer used, but the old dam remains. A small section has been blown out and through this opening the low water flow of the river passes; but at times of flood, the dam obstructs the flow, thereby prolonging the flood period above, and should be removed.

About two-thirds of the bottom land produces a crop from half to

two-thirds of the time. The soil is a deep brown silt loam, according to the University of Illinois Soil Report of Mercer County.

In the Mississippi bottoms between Keithsburg and the mouth of Edwards River, an area of 1,500 acres was incorporated in the Keithsburg District in 1909. The commissioners have built approximately four and one-half miles of levee and seven and one-half miles of ditches and operate a pumping plant. The undertaking has accomplished its purpose and the increase in the value of the land has greatly exceeded the cost of construction.

Between Keithsburg and Oquawka, the bottom land is composed mainly of dune sand and is not worth reclaiming. Northeast of Keithsburg there is a wet area of about 2,600 acres which needs draining.

In Henderson County three districts have been formed in the Mississippi bottoms. The one farthest north is Henderson County District No. 3, which was completed in 1915. It has constructed ten miles of levee which gives protection to the 2,300 acres in the district. Five miles of interior ditches have been dredged, and a pumping plant has been installed for disposing of the excess water. Henderson County District No. 1 joins No. 3 on the south. There are 9,120 acres in this district which are protected by nine miles of levee. Five miles of ditches have been constructed to carry the rain water to the pumps. In 1912, when the district was organized, the land sold for \$25 an acre. The commissioners consider the land to be worth \$300 an acre at the present time. The third Henderson County District is No. 2 and is located directly south of No. 1. This district contains 7,620 acres and consists of four miles of levee and seven miles of ditches. The conditions here are similar to those in the other two districts. All of these districts are considered successful though they have had trouble in maintaining their levees. To quote the Secretary of Districts No. 1 and 2, "The most discouraging feature is the failure of the general government to extend any aid whatever in the repairing and maintaining of the Mississippi River levees. The waters of the river at times prove very destructive to our levees, and in many cases, the damage is caused by the construction of wing-dams in the river by the government which tend to divert the waters. While we have tried in various ways to secure assistance from the government, they have always withheld it from us. . ."

South of District No. 2 in Henderson County, the overflowed area along the Mississippi is too narrow to pay for levee protection. Also it is cut up by a number of sloughs and bayous. However, these channels are fast filling with the depositions of the river, and possibly with the increasing value of agricultural lands, it will eventually be feasible to reclaim this area.

Considerable trouble is experienced in Henderson and Warren

Counties from Henderson River, which comes down out of the hills north and east of Oquawka and spreads its flood waters over the low lands with disastrous results. It is now proposed to incorporate this area (No. 53 on map) into a district. To divert part of the flood waters, it is proposed to open a new channel from the present channel just south of Bald Bluff straight west to the Mississippi. To construct such a channel would mean a depth cut of 60 feet in places, with a minimum depth of 10 feet. The old channel below the proposed cut-off would be used as the main ditch of the district. There are 5,000 acres in the proposed district, which is indicated in blue on the map.

Above the proposed district just discussed, the overflow along the river and its several tributaries will average about one-half mile in width, and affects some 14,500 acres of land. If the proposed cut-off is constructed the upper river will be much improved.

Occasional destructive floods are reported along Ellison Creek in Stronghurst township. The outlet of this creek is the drainage ditch of Henderson County District No. 2.

The western half of Hancock County drains into the Mississippi. The topography of this county is rolling to broken and the natural drainage is good. Above Warsaw, the river flows along the bluffs and there is only one small area of overflowed land which is near Niota (East Fort Madison). The construction of the Keokuk dam caused the flooding of some land here, which the Mississippi Power Company purchased and organized in the Niota District.

Below Warsaw all the bottom land in Hancock County is within the Hunt Drainage and Levee District, which was organized in 1880 and contains 16,000 acres. The land in the district is protected by a levee about 11 miles long which joins the levee of the Lima Lake District in Adams County. The levee was built in 1880, but has since been enlarged and strengthened several times. The last work of this kind has just been completed and the levee is now three feet above the high water mark of the 1851 flood. The levee has broken several times, and all the land in the district completely submerged and all crops destroyed. The last break occurred in 1903. No interior drainage has been provided and there are now sloughs and water courses from the north end of the district which run through the district and extend into Lima Lake District on the south. These water courses have become obstructed with sediment and debris, and there is much land that cannot be cultivated, especially in the lower end of the district, where there are some 1,400 acres of such land.

The county line divides the Hunt and Lima Lake Districts, and has been the cause of trouble for both districts. Had it not been for this line, the entire area would have been organized into one district, and all the

area would undoubtedly be under cultivation. There has always been a dispute as to plans for reclamation and as to the proper division of cost between the districts. One of the commissioners of the Hunt District advises that the two Boards of Commissioners have about agreed upon a plan of drainage; but the division of the cost of the diversion ditch along the bluffs, which is part of the proposed plan, has not been settled. This ditch will be constructed along the bluffs west of both districts and empty into the Mississippi south of the Lima Levee District.

In addition to the diversion ditch, the plans call for the construction of a complete interior drainage system and the installation of a pumping plant.

The Lima Lake District contains 13,480 acres, and has constructed 11 miles of levee and four miles of ditches. It was organized in 1885, and like the Hunt district, has done considerable work on its levee from time to time. About 5,000 acres in this district are too wet to cultivate. It has a levee along the south boundary along Bear Creek.

On the south side of Bear Creek, the Indian Grave District is located. This district contains 19,000 acres and is triangular in shape, the apex extending almost to Quincy. The Mississippi levee is about one and one-half miles from the river. Fifteen miles of levee have been built and thirty miles of ditches. This district has been overflowed three times since its organization in 1880, the last time being in 1918. The ditches are not complete and a petition for an additional assessment to complete them has been filed. Some 1,000 acres within the district are useless at present.

The area of about 5,000 acres between the Indian Grave District and the river is now being organized into the Long Island Drainage and Levee District.

South of Quincy, 5,590 acres are combined in the South Quincy Levee and Drainage District which has constructed eight and one-half miles of levee and twelve miles of ditches. The land has increased in value from \$25 an acre to from \$100 to \$300 an acre. Except for about 1,000 acres which cannot be cultivated, the district is operating successfully.

The upland areas in Adams County possess sufficient slope, so that no artificial drainage is required. There are no large streams and consequently no overflowed areas worth considering. The largest such area is along Bear Creek, but the floods are of short duration and apparently do little damage.

The largest district in the State occupies the flood plain of the Mississippi throughout Pike County and extends about eight miles into Calhoun County on the south and about three miles into Adams County on the north. This is the Sny Island District, which was first organized in 1870, but at that time there was no drainage provision in the Constitution and the Supreme Court held that its organization was unconstitutional. After the Constitution

was revised in 1878 containing a drainage provision, and the Levee Act had been passed by the Legislature in 1879, the Sny Island District was reorganized in 1880, containing 110,000 acres within its boundaries.

A levee was constructed from the bluffs in Adams County south for a distance of about 55 miles to the west bank of Hamburg Bay, which is the outlet for the waters of the district. The only drainage work carried out by the district was the construction of a main drainage artery along the Sny. The Federal Government assisted in the construction and maintenance of the levee, and to date has appropriated \$560,134 for that purpose, all of which, however, has not been expended. It was intended to construct interior ditches, levees, etc., through the formation of sub-districts. Twenty such districts, embracing all the lands of the parent district, were proposed by the engineer.

Three of these areas were organized as independent districts, namely, Fall Creek District, containing about 3,000 acres in Adams and Pike counties; Boyd District, 2,600 acres, west of New Canton; and Six Mile Drainage District, 4,900 acres, west of Pleasant Hill. Later the Boyd Drainage District was merged with the Hadley Creek Sub-district.

Of the twenty proposed sub-districts, seven have been organized and five have completed their drainage works. These are the Hadley, Kiser, Sand-Slough, Collins Pond, and Bay Creek Drainage Sub-Districts. Also the proposed Cincinnatti Sub-District is being annexed to the Collins Pond District. The McCraney Creek Sub-District is about 75 per cent completed.

Four other sub-districts are in process of organization, namely, Pigeon Creek, Cockle Burr, Atlas Creek, and Tow-Head.

The creeks which enter the Sny Island District from the bluffs are the boundary lines between the sub-districts, and levees have been constructed to prevent overflow. None of the sub-districts operate pumping plants at present, though the Collins Pond, Tow-Head, and Cockle Burr districts are planning to install such plants in the near future.

Since the Sny Island District's levee does not connect with the bluffs at the southern end, the district is subject to back-water from the Mississippi, and about 23 per cent of the area is thus affected.

Practically all the lands in the sub-districts which are completed can be cultivated; but of the lands not so organized, only about 75 per cent is under cultivation.

The uplands in Pike County require no artificial drainage other than private farm-tile work. The soil map of this county shows a small amount of bottom land soils along some of the small streams, but all of these streams have considerable slope and hence floods are infrequent and of short duration.

The west half of Calhoun County drains into the Mississippi. This county is almost entirely a ridge lying between the Mississippi and Illinois Rivers. In some places the bluffs are abrupt but for the most part they are

rounded and capable of cultivation. From the southern end of the Sny Island District south there is no flood plain of sufficient extent to make reclamation profitable.

Near the southern end of Calhoun County, the ridge gradually flattens and gives place to a swampy flood plain at the mouth of Illinois River. This area has been considered in this report as within the Illinois River watershed and is treated further in that chapter.

From Grafton to Alton the bluffs are close to the river and there is no overflowed area. Here the watershed widens out and extends nearly to Litchfield in Montgomery County. The southeast corner of Jersey County drains through Piasa Creek into the Mississippi. The topography consists of rolling to broken upland areas terminating in steep bluffs at the river. There is no need of drainage, except along Piasa Creek which overflows its bottom. The extent of this overflow is small and is not shown on the map. Whether or not it would be profitable to straighten the creek is a matter of further engineering study.

Cahokia Creek is the largest stream in this portion of the watershed. It rises west of Litchfield and flows southwesterly to the Mississippi. The overflowed area along this stream varies from one-fourth to three-fourths of a mile in width and contains about 6,000 acres. A large part of the crops is lost nearly every year along the creek. This is a feasible drainage project and will undoubtedly be organized into a district eventually.

North of Edwardsville, the Cahokia Creek Drainage and Levee District has been organized, embracing 4,000 acres along Cahokia Creek, and is giving satisfactory results.

Between Alton and Wood River, the Wood River Drainage and Levee District was organized in 1910 but is not yet completed. There are 4,390 acres in this district which is constructing seven miles of levee and five miles of open ditch. This area was overflowed in 1915, but will be protected when the levees are completed. The commissioners place a value of \$800 an acre upon the land, due to its proximity to Alton and its availability for industrial purposes. Adjoining the Wood River District on the north, an area of 900 acres along the east fork of Wood River is now being formed into the East Wood River Drainage and Levee District. The preliminary surveys have been made and the proposed plans provide for the straightening of the channel for about three and one-half miles.

Below Alton the bluffs along the Mississippi recede rapidly and leave a plain from three to eight miles in width. This area is known as the American Bottoms and is largely used for industrial purposes. In the southern part, the big industrial and railway activities centering around East St. Louis dominate the land, and all along the railroad between Alton and East St. Louis, industries of various kinds are buying up large areas of the bottoms. This

increases the necessity for complete flood protection and sanitary drainage over that required for purely agricultural lands.

The only part of this area which is not included in an organized district is a tract of about 4,000 acres just south of Wood River.

About five miles west of Edwardsville, a small mutual district of 600 acres has been constructed along Indian Creek.

The second largest levee district in the State embraces the bottom lands around East St. Louis. This is the East Side Levee and Sanitary District which was organized in 1907 for the protection from overflow of about 65,860 acres of bottom land. The district has a length of about 17 miles along the river and extends to the bluffs on the east, a distance of about six miles. The district contains the cities of East St. Louis, Venice, Madison and Granite City, and includes extensive railway and manufacturing interests, although about 90 per cent of the area is farm land. A considerable part of the land is practically useless at present due to inadequate drainage.

A channel has been constructed above the north end of the district to divert the water of Cahokia Creek from the district. This is the largest of the hill streams and formerly followed a winding route through the district to East St. Louis where it emptied into the Mississippi. The diversion channel is leveed, and another levee extends along the river to the lower end of the district and thence to the bluffs. The levee on the south along the Prairie Du Pont channel, which is the southern outlet ditch of the district, is just being completed. The district has to take care of the drainage from about 81 square miles of the hill country in the watershed as well as that from the district itself. The commissioners are planning to improve the old Cahokia Creek Channel through the center of the district and to install a pumping plant of 1,000 sec.-ft. capacity at the lower end; also the improvement of the present ditch which is the outlet for the southern half of the district and the installation of a pumping plant of 500 sec.-ft. capacity at its lower end.

In 1912, the County Ditch Drainage and Levee District was organized at the northern end of the East Side Levee and Sanitary District. This district contains 4,742 acres of which 2,342 acres are within the boundaries of the East Side Levee District. Eight miles of levee and a large mileage of open ditches have been constructed. The district was overflowed in 1915, and portions suffer annually from too much water. About 100 acres in the district are not useful. The value of the land ranges from \$100 to \$150 an acre.

The Chouteau Island Drainage and Levee District was organized to reclaim 2,360 acres on Chouteau Island. A levee has been constructed along the river and the district is operating successfully.

In 1888, the Chouteau, Nameoki, and Venice Drainage and Levee District was organized for the protection of 17,500 acres north of the Toledo, St. Louis and Western Railway, and about 25 miles of levee were built to

keep out the flood waters. The district has been successful and is free from overflow except during extreme floods. Later, when the East Side Levee and Sanitary District was organized, some 12,600 acres of the district were included in the new one, and its levee used as part of the works of the new district.

West of Collinsville, 1,640 acres were organized into the Canteen Creek District. This area is adjacent to the East Side Levee and Sanitary District and functions essentially as a sub-district of the larger organization.

East of Dupon, the Falling Springs Drainage District is located. There are only 920 acres in this district, which was organized mainly to construct a channel for diverting the water of Falling Springs. The project has accomplished its purpose. All the rest of the Mississippi bottoms in St. Clair County is contained in the Prairie Du Pont Drainage and Levee District. The railroad embankment provides a levee for the district on the west and a spur levee to the bluffs has been constructed on the north. While there is some land in the district which is wet, most of it has been reclaimed and is raising excellent crops.

All of the bottom land in St. Clair County is within districts. The upland prairie is rolling and intersected by numerous small streams which provide natural drainage.

Throughout Monroe County the flood plain is uniformly about three and one-half miles in width, and with the exception of a 2,500-acre tract west of Columbia, it is all contained in levee districts.

The first of these is the Wilson and Wecker Levee District which was organized in 1883 for the purpose of constructing a levee along the river to protect the 1,600 acres of the district from overflow. Two miles of levee were built but there are no ditches and consequently the land is frequently flooded from rainfall. About 500 acres cannot be used for farming. The district suffers on account of water which naturally drains south from the Prairie Du Pont District on the north.

Immediately south of the above district is the tract previously mentioned as being outside of any district.

Next comes the Columbia Levee and Drainage District No. 3, also an old district formed in 1880. The drainage works consist of twenty-two miles of levee and sixteen miles of ditches. The district was overflowed in 1881, 1882, 1883, 1892, 1903, 1908 and 1915. There are 13,500 acres in this area of which about 500 acres are not useful. The outlet is through four large tile drains in the levee into Fountain Creek. The land is valued at about \$100 an acre. The unreclaimed area to the north might be annexed advantageously to this district.

From Fountain Creek to Ivy Landing the bottom land is protected by the 20-mile levee of the Harrisonville and Ivy Landing Drainage and Levee District No. 2, which was organized in 1882. Approximately 26,700 acres

of land are protected by this levee, of which 16,700 acres were organized into the Moredock and Ivy Landing Drainage District No. 1 in 1908. This area has been overflowed several times since the levee was built, the last overflow occurring in 1903. District No 2 has constructed ten to fifteen miles of ditches which have their outlet in the main ditch of District No. 1. The latter district has twenty miles of ditches with a lock at the lower end of the main ditch. The slopes are flat and as it is necessary to close the lock at high river stages and permit the water to collect behind the lock till the river recedes, it frequently happens that crops are damaged and sometimes lost. This is especially true in District No. 1. The commissioners would like to install a pumping plant, but the sentiment among the land owners seems to be opposed to this much needed improvement. The land is very fertile and should be thoroughly protected against flooding.

South of Ivy Landing, the bottoms are protected by the levee of the Fort Chartres and Ivy Landing Levee and Drainage District No. 5 and the Stringtown and Fort Chartres Levee District No. 4. The former contains 10,500 acres and the latter 3,200 acres and both extend into Randolph county on the south. Neither district has a pumping plant, and the condition of the land is about the same as that in the districts to the north.

It will be noticed on the map that the levees of most of the districts in Monroe County are from one-half to one mile from the river bank. This strip along the river is so cut up by by-channels that its reclamation would be very difficult and probably prohibitive.

Very little reclamation work has been done in Randolph County, and the flood plain as far south as the mouth of Kaskaskia River presents feasible drainage projects. The bottoms are about three miles in width and contain approximately 13,000 acres. The owners of this land are waiting in hopes of receiving aid from the Federal Government.

The Marias Giteau Drainage and Levee District, containing 525 acres, was organized principally for the protection of the town of Prairie Du Rocher and has successfully accomplished its purpose.

West of Roots, between the Missouri Pacific Railroad embankment and the bluffs, 2,000 acres were organized in 1917 into the Edgar Lakes Levee and Drainage District. The plans call for the construction of half a mile of levee and between four and five miles of ditches. The levee at the north end of the district, which protects the district from overflow, has been completed, and the ditches are partly completed. The original assessment was insufficient to meet the cost of construction, and the work is being held up until a second assessment can be made. The outlet of the district is in Kaskaskia River, but since the land is in the Mississippi bottoms, it has been included in that watershed.

Between Chester and Fort Gage, a strip of bottom land about one-

fourth of a mile in width is being reclaimed by convict labor from the State Penitentiary at Chester.

Across the river from Chester, the Kaskaskia Island Drainage and Levee District was organized in 1916 and completed in 1918. About 10,000 acres are included within the district, surrounded by a levee. Outside the district there are about 2,500 acres which should be included. The commissioners have constructed ten miles of levee, one mile of open ditch, and one mile of large tile drain. Since there is no pumping plant the district suffers from rainfall. Before the levees were constructed the Island was subject to frequent overflow and its land was valued at about \$80 an acre. At present the value ranges from \$100 to \$160 an acre.

South of Chester, Marys River enters the Mississippi. The bottom land along this stream is considerably damaged from overflow, about three out of five crops being lost. The width subject to overflow is about one-half to three-quarters of a mile. The river is quite crooked, and the improvement here should consist of channel straightening. While some of the land owners are in favor of organizing a district for this purpose, general sentiment is not very favorable, and it will probably be some time before this area is reclaimed.

In Jackson County, the Mississippi bottoms widen out to a maximum of six miles as far south as Fountain Bluff. All of this area is protected against overflow of the Mississippi by the levee of the Degonia and Fountain Bluff Levee and Drainage District, which contains 29,260 acres. Within this levee district there are two small drainage districts previously organized, namely the Jones Pond Mutual and the Boones Pond. The former district, consisting of 2,060 acres, was formed in 1900, and its drainage work comprises one mile of ditch, which provides satisfactory drainage. The latter district, embracing 1200 acres, was organized in 1914. It has not been successful since it is flooded yearly.

A fourth district, the Big Lake Special, occupies part of the bottoms. There are 16,050 acres in this district, 60 percent of which is in the Degonia and Fountain Bluff District. The Big Lake Special extends eastward to the Big Muddy River bottoms, and is protected against overflow from this direction by a levee. Some difficulty was encountered in incorporating the three drainage districts into the levee district but since they all needed the protection of levees along the Mississippi, all objections were overcome. The Degonia and Fountain Bluff District did not install a pumping plant and as a result the lands are seriously damaged by the hill waters which collect behind the levee when the sluice gates are closed. The extreme fertility of the land warrants the removal of rainwater either through pumping or diversion channels. The commissioners of the levee district have had surveys made and plans are being prepared for a diversion channel around the district. If this improvement is constructed, the lands will be greatly benefited. However,

it would seem that a pumping plant for removing the rain and seepage water from the district would be profitable. The average cost of the levee district has been about \$20 an acre.

The Grand Tower Drainage and Levee District is situated in the southern part of Jackson County, between the Illinois Central Railroad and Big Muddy River, and has successfully reclaimed 2620 acres of rich bottom land. The railroad embankment acts as a levee on the west, and a levee has been constructed along the Big Muddy on the east. The average cost of the district has been \$11 per acre.

The Preston Levee and Drainage District contains 16,200 acres at the northern end of Union county. It has 17 miles of levee along the river which joins the levee of the district to the south. The main ditch is 16 miles long and has its outlet in the Clear Creek ditch. As a result of protection and drainage, land values have risen from \$30 an acre in 1913 to \$90 an acre at the present time and the majority of the land owners are much pleased with the results of the undertaking.

The Miller Pond Drainage and Levee District occupies the bottoms east of the Illinois Central Railroad between Wolf Lake and Ware. The petition was filed in 1913, but the objectors succeeded in delaying the organization two years. Seven miles of levee protect the land from overflow and 22 miles of ditches remove the rain-water from the 4300 acres within the district. The outlet is through the main ditch of the Clear Creek district on the south, which has Miller Creek for its outlet, which in turn empties into the Mississippi. During floods, the Miller Pond District is injured somewhat from backwater.

The Clear Creek Drainage and Levee District includes the remainder of the Mississippi bottom lands in Union County. It was organized in 1913, embracing 19,130 acres, and completed its construction work in 1919. Nine and one-half miles of levee and ten miles of ditch constitute the work done thus far. Both of the districts lying to the north drain through the Clear Creek District, and the large volume of water causes some damage in the lower district. There is much dissatisfaction among the land owners affected, and it has been suggested that the hill water which comes down through Clear Creek be diverted into the Mississippi by a cut-off channel in the vicinity of Ware. The commissioners feel that a pumping plant of sufficient capacity to handle such a large volume of water is prohibitive in cost.

The East Cape Girardeau and Clear Creek Drainage and Levee District is situated in the northwestern corner of Alexander County to the west of the Illinois Central Railroad. It was organized in 1908 and includes 9370 acres of very fertile bottom land. The district is exposed to the river on three sides, and about fifteen miles of levee were necessary to protect the area. The Federal Government assisted in the levee construction. The dis-

tract is satisfactorily protected from overflow from the river, but during flood stages when the sluice gates are closed, the storm water precipitated within the levees causes considerable trouble. Twelve miles of ditches furnish outlets for the tile drains. About 10 percent of the area cannot be cultivated. A pumping plant is very much needed in this district, and the cost of such a plant would not be excessive since there are no hill waters entering the district. The present value of the land varies from \$100 to \$200 an acre.

The North Alexander Drainage and Levee District was organized in 1910 to reclaim the 4400 acres of land between the East Cape Girardeau District and the bluffs. Five miles of levee and seven and one-half miles of ditches have been constructed, the last work being completed in 1918. The district is having much trouble on account of the overflow of the main ditch which is the outlet for all the districts in Union County. When the river is at flood stage, the ditch overflows its banks and causes considerable damage. A plan has been considered which provides for a diversion ditch at the north end of the district. Some thought has been given to the feasibility of pumping. While definite plans have not been approved, yet the sentiment among the land owners is such that without doubt some measure will be taken to improve the present condition.

In the southern tip of Alexander County, made by the big bend of the Mississippi, there are 16,000 acres of excellent land that are frequently overflowed, and which present a possible levee project. To protect this area a levee would have to be built on three sides, and a pumping plant should be installed. The size of the area and the fertility of the land warrants the necessary expense.

Throughout the Mississippi watershed, the main object of the districts which have been formed has been to protect the land from overflow by the construction of levees. Only in a few cases has any provision been made for removing the water, which collects behind the levees during flood periods. Some districts are planning diversion ditches for the hill water, but only five of the fifty-one districts operate pumping plants. This is quite a contrast with the practice which has been followed along the Illinois River. Practically every levee district along the latter stream has a pumping plant as part of its works, and considers such a plant an absolute necessity. Possibly it is because of the better drainage in the Illinois River districts that makes this land from \$100 to \$150 an acre more valuable than the Mississippi bottom land. For that matter, the land in the pumping districts along the Mississippi is selling at the same prices as the Illinois River land. The cost of installing pumping plants in the districts which are without them would be much less than the increase in the value of the land which would follow as the result of more thorough drainage.

To recapitulate: (1) 51 districts with a combined area of 500,300 acres have been organized within the Mississippi watershed; (2) four districts

with a total area of 12,900 acres are in process of organization; (3) approximately 105,700 acres are still subject to overflow; and (4) at least 2600 acres of wet upland are in need of better drainage. It is estimated that about 36,000 acres in organized districts may still be classed as unreclaimed land. This added to the overflowed and wet upland areas gives the amount which remains to be reclaimed, and represents 23 per cent of the originally wet and overflowed land in the watershed.

CHAPTER III—PECATONICA RIVER WATERSHED

The Pecatonica watershed lies in both Wisconsin and Illinois and contains 2610 square miles, of which 770 are in Illinois. It embraces nearly all of Stephenson County, a small portion of Jo Daviess, and the northwest corner of Winnebago.

The topography of the watershed is rolling except for the flood plains along the river. The uplands rise as much as 150 feet above the river valley.

Pecatonica River has a total length of 158 miles and a fall of about 500 feet. The portion of the river in Illinois is 92 miles in length with a fall of only about 55 feet. The channel averages about 150 feet in width and is very crooked, doubling back on itself frequently and forming oxbows. The flood-plain has an average width of a mile or more.

No drainage districts have been or are being organized in this watershed. The uplands have good natural drainage and the small areas here and there which might be improved by tiling can be taken care of by individual owners.

The drainage problem is confined to the Pecatonica bottoms. The tributary streams flow through valleys which narrow to almost the banks of the streams as soon as the main stream is left. The hill sides are so steep that the run-off is large and the small streams are subject to sudden floods of short duration. These hillsides are in grass to prevent the erosion which would take place if they were cultivated, and furnish excellent pasturage.

Approximately 32,000 acres in the Pecatonica bottoms are subject to overflow. A few crops are grown on the higher parts, but seldom is a good crop harvested. If a spring flood does not prevent planting, a summer or fall flood will usually destroy the growing crop.

The small natural fall in the Pecatonica has been decreased by the construction of three dams across the stream. At Freeport, the Railway and Light Company uses Goddard's Dam for developing power for lighting and traction purposes. Likewise the Pecatonica River Power Company uses Brown's Dam, which is located about 10 miles below Freeport, for the same purpose. These dams are about four feet above medium low water. At Pecatonica a dam, about 4.5 feet in height, was formerly used to operate a grist mill, but is now serving no useful function.

The surface soil, 0 to 6 $\frac{2}{3}$ inches, of the bottom land is a brown mixed loam, varying from a silt to a sandy loam, and contains an average of 6.3 percent of organic matter. It is fairly rich in all important plant-food elements. The subsurface soil extends to a depth of from 16 to 24 inches and is also a brown silt loam. This soil is more variable than the surface soil and averages about 3% of organic matter.¹ Thus it is seen that from the stand-

¹University of Illinois Ag. Exp. Station Soil Report No. 12, Winnebago County.

point of fertility this bottom land is excellent agricultural land, and, if it were only protected from overflow, would add considerably to the wealth of this section of the State.

In 1914, the Rivers and Lakes Commission made a topographic survey of the river bottoms from a point 14.5 miles above Freeport to Brown's Dam, 11.6 miles below Freeport, with the special object in view of finding out to what extent the dams in the stream were contributing to the overflow conditions. Later a further reconnaissance was made by this commission to assist in making flood prevention plans for the city of Freeport. While this was being done, the most severe flood in the history of the valley occurred in March 1916, which caused an estimated damage of \$100,000 at Freeport.

In 1915, the State Geological Survey in cooperation with the U. S. Geological Survey surveyed the Pecatonica River Valley, and topographic maps were made with a five-foot contour interval, so as to be available for drainage reclamation studies.

The Rivers and Lakes Commission published the results of its investigation and study as Bulletin No. 18, dated December 1, 1916. Two of the conclusions given in this report are as follows:

"4. That the river, in its natural state, spreads out over the whole valley during flood periods and the tendency is toward a general increase of flood height and property damage due to the silting up of the channel and the encroachment of civilization.

"5. That the benefits to be derived from a general project designed to prevent the inundation of the valley as a whole would not, at the present time, be commensurate with the cost of such work, but the annual damage sustained at Freeport and vicinity is sufficient to warrant the outlay necessary to protect that city against a flood flow of 21,000 cubic feet per second, or nearly 25 per cent greater than that of March 28, 1916."

Plans for the protection of Freeport were given in this report, but so far they have not been acted upon. While, as this report states, it may not be a paying investment to reclaim the "valley as a whole," due to the narrowing of the valley in places, yet the larger part of this land can be economically protected from overflow. The latest practice in channel correction design is to leave the old crooked channel and to construct an entirely new channel. Where the valley is several miles wide, this may be the most economical design; but where the valley is comparatively narrow, as in the case of the Pecatonica, most of the old channel would have to be utilized. However, numerous cut-offs are possible. Below Freeport the length of the present channel is about 62 miles. By constructing about nine miles of new channel, this distance can be reduced to about 37 miles. Fortunately most of the new channel can be located near the bluffs, so as to throw all the reclaimed area on the same side of the stream and to make the construction of only one levee necessary. The excavated material can be used for this purpose. The cost of this channel improvement should be assessed against all the

lands in the valley which will be benefited by the improved outlet. In places levees would have to be constructed on both sides of the stream, and where the valley is narrow, this might make the cost prohibitive.

The most difficult part of the project to carry into effect would be the channel correction, due to the large number of owners concerned and to the difficulty in making an equitable division of the cost. Once this part is done, the organization of separate districts for further local improvement should be easily accomplished.

It is true that the reclamation of this land will be more expensive per acre than that in most of the river valleys of the State; however, it should not be considered impracticable till a more detailed study of the situation is made, taking into consideration the increasing value of farming lands, and the demand for greater food production.

CHAPTER IV—ROCK RIVER WATERSHED

The total area drained by Rock river is about 11,000 square miles, of which 5210 miles are in Illinois. The main tributaries are the Pecatonica, the Kishwaukee, and the Green which are treated as independent watersheds in this report. The watershed of Rock River as indicated on the accompanying map contains 770 square miles and covers part of Boone, Winnebago, Ogle, Carroll, Lee, Whiteside, Henry, and Rock Island counties. The drainage data for this watershed are given in Table 5.

TABLE 5.—*Drainage data for the Rock River watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Hunter.....	Boone	720
2	Rockford and Winnebago Special.....	Winnebago	2,160
3	Kyte River.....	Ogle	4,500
4	Brush Grove.....	Ogle-Lee	11,000
5	Harmon No. 1.....	Lee	7,240
6	Union No. 1, Harmon and Montmorency.....	Lee-Whiteside	3,400
7	Union No. 1, Harmon and Marion.....	Lee	7,200
8	Union No. 1, Tampico and Hahnemann.....	Whiteside	6,200
9	Montmorency Special.....	Whiteside	6,240
10	Union No. 1, Prophetstown and Hume.....	Whiteside	3,840
11	Union Special of Tampico, Prophetstown, Hume...	Whiteside-Lee	45,000
12	Enterprise.....	Whiteside	2820
13	Union No. 1, Erie and Fenton.....	Whiteside	11,060
14	Whiteside and Rock Island Special.....	Whiteside	20,000
15	Rock River D. and L. ^a	Henry-Whiteside	3,000
16	Phoenix No. 1 (Farmers).....	Henry	3,360
17	Union No. 1, Zuma and Hampton.....	Rock Island	3,000
18	Hampton No. 2.....	Rock Island	2,700
19	Hampton No. 3.....	Rock Island	1,600
	Total.....		145,040
<i>Districts being organized</i>			
20	Black Hawk No. 1.....		1,400

^aNo work done.

TABLE 5.—*Drainage data for the Rock River watershed—Concluded*

Reference No.	Name of district	County	Area
<i>Overflowed areas</i>			
21	Overflow along Rock River above Dixon.....	Lee-Ogle	<i>Acres</i> 12,300
22	Overflow along Rock River between Dixon and Sterling.....	Lee	6,000
23	Overflow along Rock River below Sterling.....	Whiteside-Rock Island	45,500
24	Overflow along Rock River south of Rock Island ..	Rock Island	10,500
	Total.....		74,300
<i>Upland areas needing drainage</i>			
25	South of Dixon.....		24,000

Rock River is 286 miles in length, about 157 of which is in Illinois. Of the length in Illinois 96.5 miles is above Sterling. In the 108.5 miles from Janesville, Wisconsin, to Sterling the fall is 134 feet—over 1.25 feet per mile—and is fairly well distributed. Six power dams have been constructed across the river, two in Wisconsin and four in Illinois. Those in Illinois are at Rockford, Oregon, Dixon, and Sterling. The first three were constructed and are operated by private power companies, while the one at Sterling was built by the Government at the head of the feeder for the Illinois-Mississippi Canal.

Rock River is an interstate navigable stream and an investigation was made by the Federal Government in 1914 to determine the feasibility of constructing the necessary locks at the several dams, and of dredging the stream in places to make a 7-foot navigable channel. The decision reached was that the commerce which might be expected as a result of the proposed improvement would not warrant the cost of construction.

The area of this watershed in Boone and Winnebago counties is mostly high ground and has good natural drainage, though small level areas here and there would be improved by artificial drainage. Such areas can be taken care of through individual effort. There is one small district of 720 acres in Boone County, known as the Hunter Drainage District. The Rockford and Winnebago Drainage District, 2160 acres, is located about four miles west of Rockford and is entirely in Winnebago County. This district was organized in 1916 with the greatest difficulty, due mainly to the uncertainty on the part of most of the land owners as to the benefits of drainage. However, after a long court fight, the district was finally organized and construction work was in progress at the time when this county was being studied.

Through Boone and Winnebago counties the valley of Rock River is from one to four miles wide, but the river has cut a deep channel and there is no overflow.

The land in Ogle and Carroll counties west of Rock River is rough and rolling and has good drainage. Just east of the river the ground is slightly rolling, but it soon becomes flat and the drainage is poor. The soil type is a silt loam. Northeast of Rochelle the Kyte River Drainage District including 4500 acres has been organized. Although organized in 1914, this district was not quite completed when Ogle County was visited. It has six miles of open ditches and four miles of large tile, and has its outlet in Kyte River. The value of the land has increased from \$200 an acre to \$300 as a result of drainage. Drainage sentiment is now favorable in the community.

The Brush Grove Drainage District, including 11,000 acres, joins the above district on the southwest and is partly in Ogle and partly in Lee County. It was organized in 1893 and completed in 1895. Originally 15 miles of open ditches were used which eventually became filled with silt. The ditches have recently been cleaned out and large tile have been substituted for some of them. This district is overflowed nearly every year, but the project is considered a success and the present market value of the land is \$300 an acre. The commissioners state that some adjoining land should be taken into the district.

Only a few farms in Ogle County east of the river do not need a small amount of drainage, and possibly other districts will be formed in this area as the drainage sentiment is good.

In the southern part of Ogle County and extending into Lee County to Dixon, approximately 12,200 acres of overflow land lie along the Rock River. Between Dixon and Sterling there are approximately 6,000 acres of such lands.

Lee County has always been poorly drained. An old record at Springfield, dated 1857, states that there were at that time 70,000 acres in Lee County which were unfit for cultivation, and there are still large areas of such lands, most of which are in the Green River watershed. Between Dixon and Amboy there is a large area of wet land, indicated on the map in green, which comprises 24,000 acres, though the boundaries are only approximate.

Several districts have been organized in the west central portion of Lee County, namely: Harmon No. 1, 724 acres; Union No. 1, Harmon and Montmorency, 3,400 acres; Union No. 1, Harmon and Marion, 7,200 acres. These are old districts and the boundaries as shown on map may be somewhat in error, since satisfactory information concerning them was not obtainable. They were all organized under the Farm Drainage Act. It is believed that the area in these districts is not fully reclaimed.

In Whiteside County below Sterling, the character of the valley changes. The slope of Rock River is much less than it is above Sterling and the channel meanders back and forth across the flood plain which is as much as three miles wide in places. This change is due to the fact that at some period in geologic history a larger stream than Rock River flowed through this valley. It is believed that the pre-glacial Mississippi flowed through the Meredosia Valley above Cordova, through the Rock River valley at Erie and then southeasterly to the Hennepin Bend in Illinois River. Also some pre-glacial stream may have flowed through Pleasant Valley and eastward up the present Rock River.

The flood plain below Sterling is overflowed every year in the early spring and about every other year in May or June. The map shows 36,000 acres of such lands which are not in drainage districts. A considerable area of certain districts also suffers from overflow.

The southeastern corner of Whiteside County is nearly all in drainage districts. Union No. 1, of Tampico and Hahneman, 6,200 acres, Montmorency Special, 6,240 acres; Union No. 1 of Prophetstown and Hume, 3,840 acres, and Union Special of Tampico, Prophetstown, and Hume, 45,000 acres, are all in this part of the county. The last named district was organized in 1882 after long and bitter court proceedings. It has been added to from time to time until now it contains 45,000 acres and extends into Montmorency and Hahneman townships. This area was originally all swamp land and the widely scattered farm houses could be reached in the spring of the year only by boats. Drainage has changed this condition, so that now the area is fine farming land, valued at \$300.00 an acre.

Union district No. 1 of Hume and Prophetstown is just north of the last mentioned district and uses Walker Creek as an outlet. It should be enlarged by the addition of certain adjoining areas. This district should have taken in more territory down stream to the west. Just below the district there is a gravel ford which the commissioners have been trying to get lowered two feet but the owners have objected and the issue has not been forced. Some 1,000 acres would be much benefited by this improvement. The commissioners have given the average value of the land in the district as \$100.00 an acre.

Just west of the big Union Special district is Big Slough Special of which about 3,000 acres are in the Rock River watershed and 15,000 acres in the Green River watershed. Since the greater part of this district is in the latter watershed, it is listed in the table under Green River.

The Enterprise district, 2,820 acres, is in the lower end of "Cattail Valley," the upper end being in the Mississippi watershed. Cattail Valley, although a mile in width, is now occupied by only a small creek. It was evidently cut by a large pre-glacial stream, possibly the Mississippi. The valley was swampy and much of it covered with water till it was reclaimed. The

valley floor is lower than the second bottoms along the Mississippi. In extreme floods the district is flooded, but these occur usually in the winter or spring. The land has increased in value from \$25 an acre to \$200, and the project is considered a success.

Joining the Enterprise on the south is Union district No. 1 of Erie and Fenton which contains 11,060 acres. It was organized in 1879, and has constructed $1\frac{1}{2}$ miles of levee along Rock River and 8 miles of interior ditches. All the area is cultivated and is practically free from floods. The commissioners place a value of \$175 an acre upon the land. Some of the adjoining land should be annexed to this district.

To the west of and slightly overlapping Union district No. 1, is the Whiteside and Rock Island Special, which contains 20,000 acres and is the second largest district in Whiteside County. This district was organized in 1881 and has built half a mile of levee and 30 miles of open ditches. About 1,000 acres in the district are not useful. The land is overflowed every year and plans are now proposed to remedy the situation by building a levee from Hillsdale to the northeast corner of section 27, and thence north to the Chicago, Burlington and Quincy Railway. The railway embankment will serve as a levee to Erie which is at the eastern boundary of the district. Between the district and the river there are about 3,000 acres of bottom land that should be included in the district. The soil is mostly brown sandy loam, brown loam, and mixed loam. Nearly all of this bottom land is owned by one man who is opposed to the project. The levee should follow the present road along the river. This road is proposed for improvement from Hillsdale to Erie, and the drainage district and county should join forces in carrying out this project.

On the south and east of the bend in Rock River at Hillsdale, is a tract of land of some 10,000 acres, which should be in one district. In 1913 the Rock River Drainage and Levee District was organized in the eastern portion of this tract. However, the commissioners could not agree as to the best plan of drainage and the land owners in the southern half withdrew and formed the Farmer's District (Phoenix Township No. 1), embracing 3,360 acres, and constructed an outlet to the south. In the original Rock River District, however, no construction work has been done as yet. Before either of these districts can be completely reclaimed a levee must be built. The area in this pocket can be reclaimed at less cost than any of the bottom land along Rock River.

In Rock Island County a streamless valley called Pleasant Valley, lying between Watertown and East Moline on the Mississippi and extending east to the Rock River valley at Barstow, connects the Mississippi and Rock River valleys. The elevation of Pleasant Valley is from 20 to 30 feet above the river at either end and the soil is largely a brown sandy loam with black mixed loam in the low areas. Practically all of the valley is included in

three districts, namely, Union No. 1, Hampton and Zuma, Hampton No. 2, and Hampton No. 3, which together contain a total of 7,300 acres.

West of Coal Valley an area of 1,400 acres is being organized into a district which will be known as Black Hawk No. 1. The petition has been filed and commissioners appointed. This is the only new work being undertaken in the Rock river watershed.

From the mouth of the river for a distance of some 13 miles the valley is overflowed for a width of about two miles. This is caused by backwater from the Mississippi as well as from floods on Rock River. There are about 10,500 acres of overflow in this location which are classified in the Rock River watershed.

In all, 19 districts, containing a total of 145,040 acres, have been organized in the Rock River watershed. With the exception of the 24,000 acres of wet uplands in Lee County, and the 74,300 acres of overflow bottom land, this watershed has about all the artificial drainage which it needs. This statement does not mean that there will be no more districts formed except in the wet areas specifically mentioned. There are areas here, as in other localities, which cannot be classed as wet lands but which are not producing the crops they should, due to too much free water in the soil. Eventually, as more intensive farming methods are employed, many such areas will be better drained through organized effort.

As mentioned above, certain areas now within districts aggregating 12,000 acres, are not fully reclaimed, but it is only a matter of time till they will be taken care of.

Most of the 74,300 acres of bottom lands shown on the map and listed in Table 5 can be profitably reclaimed. Undoubtedly the principal difficulty is the lack of faith on the part of the land owners. The few men who do see the possibilities, have been preaching drainage for years, but so far they have been unable to produce results.

In a few places the channel should be straightened; but there is little of this to do as compared with most of the streams in the State. Levees will have to be constructed and pumping plants installed, which seem prohibitive to those who are not acquainted with such works; but the soil is very fertile and will amply pay for its reclamation.

It is estimated that approximately 12,000 acres within organized districts may still be classed as unreclaimed land. This added to the overflowed areas, and wet uplands listed represents 45 per cent of the originally wet and overflowed land in the watershed remaining to be reclaimed.

CHAPTER V—KISHWAUKEE RIVER WATERSHED

The Kishwaukee watershed is partly in Illinois and partly in Wisconsin. The larger portion is in Illinois and comprises some 1,200 square miles situated in Boone, McHenry, Kane, DeKalb, Ogle, and Winnebago counties.

The thirty-one drainage districts in the watershed contain a total of

TABLE 6.—*Drainage data for Kishwaukee River watershed*

Reference No.	Name of district	County	Area
<i>Organized districts</i>			
			<i>Aeres</i>
1	Chemung.....	McHenry	8,640
2	Dunham Township.....	McHenry	2,200
3	Rush Creek.....	McHenry	3,000
4	South Island.....	McHenry	2,460
5	Cane Creek.....	McHenry	1,640
6	Dorr No. 1.....	McHenry	2,360
7	Dorr No. 2.....	McHenry	480
8	Kishwaukee Special.....	McHenry	5,120
9	Coral and Grafton.....	McHenry-Kane	17,920
10	Rutland and Grafton.....	Kane-McHenry	5,000
11	Rutland No. 1.....	Kane	2,320
12	Coon Creek.....	McHenry-Boone	7,500
13	Coon Creek.....	Kane-DeKalb	8,800
14	Burlington No. 1.....	Kane	1,510
15	Burlington No. 2.....	Kane	770
16	Virgil No. 3.....	Kane	3,600
17	Virgil No. 2.....	Kane	2,080
18	Union No. 3, Cortland and Virgil.....	Kane-DeKalb	8,220
19	Virgil No. 1.....	Kane	3,920
20	Union No. 4, Cortland and Pierce.....	DeKalb	2,000
21	Union No. 1, Cortland and Pierce.....	DeKalb	4,080
22	Union No. 1, Afton and DeKalb.....	DeKalb	2,560
23	Union No. 1, Afton and Milan.....	DeKalb	9,600
24	Union No. 1, Shabbona and Milan.....	DeKalb	4,480
25	Union Special, Milan, Malta, Afton and DeKalb.....	DeKalb	4,000
26	Malta No. 1.....	DeKalb	800
27	Union No. 1, Malta and DeKalb.....	DeKalb	2,000
28	Normal.....	DeKalb	1,880
29	Kishwaukee Special.....	DeKalb	3,840
30	Kilbush Mutual.....	Ogle	1,920
31	Kishwaukee.....	Ogle	3,920
	Total.....		128,620
<i>Districts being organized</i>			
32	North of Harvard.....	McHenry	1,000
33	Union No. 1, Hartland and Alden.....	McHenry	4,680
34	Deer Creek.....	DeKalb	2,720
	Total.....		8,400

TABLE 6.—*Drainage Data for Kishwaukee River watershed—Concluded*

Reference No.	Name of district	County	Area
<i>Overflowed areas</i>			
35	North of Howard.....	McHenry-Boone-Winnebago	Acres 5,150
36	Along South Branch Kishwaukee.....	DeKalb-Winnebago	2,300
37	Along Lower Kishwaukee.....	Winnebago	950
	Total.....		8,400
<i>Upland areas needing drainage</i>			
38	West of Hampshire.....	Kane	13,000
39	Northeast of Kingston.....	DeKalb	2,900
40	Northeast of Monroe Center.....	Ogle	2,300
41	North of Nichols.....	DeKalb	1,400
42	South of Wilkinson.....	DeKalb	1,800
43	Northeast of Rochelle.....	Ogle	2,000
44	Southwest of Afton and Milan District.....	DeKalb	1,300
	Total.....		24,700

128,620 acres. Three new districts with a combined area of 8,400 acres are being organized. Along the Kishwaukee, including South Branch, approximately 8,400 acres of overflowed lands can be reclaimed. There are also about 25,000 acres of wet upland areas which need better drainage, which are shown on the map in green. The investigation is not complete with respect to this classification, and without doubt there are other areas which would be greatly improved by drainage and which will in time be incorporated in districts. The drainage data for this watershed are given in Table 6.

In the extreme northern part of McHenry County and bordering on the State of Wisconsin is the Chemung Drainage District, containing 8,640 acres. It was organized in 1917, but no work has been done. Since the history of this district is rather unusual it is thought advisable to give it in some detail. The promoters of this district did not care to go to the expense of making a detailed survey to determine the exact location of the tile drains which were to be a part of the proposed system. The Levee Act provides that the petition shall state "the starting point, routes, and termini of the proposed work." The petition as prepared gave a detailed statement of the starting point, routes, and termini of the open ditches, but all the tile drains were covered in the following blanket description:

"In addition to the above open ditches, it is proposed to construct lateral tile drains, constructed in such manner that one of such drains shall commence at each

property line nearest the head or source of each swale or valley requiring drainage throughout said entire district which lies within the watershed of said open ditches, and which property line intersects said swale or valley at the intersection of such property line with the lowest spot in such swale or valley; thence across intervening lands along such swale or valley to and terminating in whichever of the open ditches herein specified would naturally receive and carry off the water falling in such swale or valley, or to and terminating in one of the tile drains herein specified leading to such open ditch as the necessities of the situation may require. Each of said tile drains shall be constructed with a slope from its source to its terminus and shall be of such size and laid at such depth as may be necessary to properly drain the land within the watershed draining to such tile. Said tile drains and open ditches shall be so constructed as to give each owner an outlet upon his or her premises without being compelled to cross the premises of any other person with any tile drains he or she may wish to put in to complete the system."

The county court approved the form of the petition and ordered the district organized, and appointed commissioners. The objectors filed a petition in quo warranto in the Circuit Court, which decided that the district had not been properly organized due to insufficient description, and had no legal existence. The case was then taken to the Supreme Court which reversed the order of the Circuit Court, finding that the description as above quoted was sufficient. A petition for a rehearing on the part of the objectors was denied. This decision of the Supreme Court should prove of considerable value in the drafting of future drainage petitions. After being defeated in the Supreme Court the objectors started a petition to abandon the districts under Section 44 of the drainage law as Amended in 1919, and the case is now in court for the fourth time.

An area of 1,000 acres to the north of Harvard is proposed for a district, but the information obtained regarding this area was rather indefinite and its exact status can not be given.

To the east of Harvard, an area comprising 4,680 acres, is being organized as Union District No. 1 of Hartland and Alden townships.

Dunham Township Drainage District, 2,200 acres, is the northernmost of a group of four districts in the western central portion of McHenry County. The boundaries of this district are only approximate and no detailed information was secured.

To the southeast is the Rush Creek Drainage District, 3,000 acres, which was organized in 1908 and completed in 1911. The area is successfully drained by 6.25 miles of open ditches and 4.2 miles of large tile. The land is underlain at a depth of from 3 to 6 feet by gravel which makes the use of small tile unnecessary over most of the area. Before it was drained the land sold for about \$25 an acre, while now its value is from \$75 to \$100 an acre.

To the southwest lies the South Island Drainage District, 2,460 acres, which was formed in 1915. The drainage of this area was effected through

the laying of 11.75 miles of tile, varying in size from 6 to 36 inches. The commissioners state that certain lands should be annexed. The improvement increased the value of the land from \$70 to \$150 an acre.

The promoters of the Cane Creek District, 1,640 acres, also had trouble through Section 44 as amended in 1919. This district was ordered organized by the County Court in 1916 without substantial objection. The commissioner's report was approved by the court and the assessment roll was prepared but had not been filed. At this stage in the proceedings an effort was made to disband under Section 44 of the Levee Act. A petition to this effect was presented to the court who ordered the district dissolved upon the payment of court cost. The case was taken to the Supreme Court on the ground that the commissioners had made contracts with engineer, attorneys, publishers, and others, and that the district could not disband without the payment of the debts already incurred. The Supreme Court held that engineer's, attorney's, and commissioners' fees could not be taxed under "Court costs"; that Section 44 was not unconstitutional, since the Act itself did not impair any contract, though the application of the Act might; and in the case in question that the order of the County Court dissolving the district impaired the validity of the contracts made by the commissioners before the Act was passed, and therefore that the Act could not apply in this case.

South of Woodstock lies Dorr Township District No. 1 containing 2,360 acres. To the east of this is located Dorr No. 2, a small district of 480 acres. Both of these districts were organized many years ago under the Farm Drainage Act. The system of drainage is inadequate and these districts and the land between and around them should be organized into one district.

The Kishwaukee Special district, 5,120 acres, was organized in 1910. Adjoining this district on the south is the Coral-Grafton District, 17,920 acres, which is partly in McHenry County and partly in Kane. Both of these districts are operating successfully.

Coon Creek district of McHenry and Boone counties, 7,500 acres, was organized in 1914 but is not yet completed. The drainage works consist of open ditches and tile drains. The ditches were constructed in 1917, but the tile drains are not yet completed. The main part of this district is a low flat tract through which Coon Creek flowed with no regular channel for miles. Formerly, only a poor quality of slough grass was grown. Since the ditches have been dug, corn is raised over the entire area. Some of the adjoining land should be annexed to this district.

The greater part of McHenry County is rolling and undulating but there are also many areas of flat lands. The streams for the most part have good fall and little difficulty is found in getting good outlets for tile drains. The soil of this county is good, but is not uniform over large areas. Many small areas underlain by peat and representing former lake beds, furnish good

farming land when drained, though the soil is deficient in potassium. These areas can be taken care of individually.

The topography of Boone County is very similar to that of McHenry County. The Coon Creek district, above mentioned, is the only district in the county within the Kishwaukee watershed. The land owners do not as yet recognize the benefits of drainage and only a few of the more progressive farmers have done any tiling. About 50 per cent of the county raises half a crop half of the time. In the valleys there are long narrow strips of wet lands which are not indicated on the map. The main area of wet lands lies on each side of the Chicago and Northwestern tracks from Caledonia to Capron. A small tile factory is located at Capron. When the advantages of drainage are better understood, no doubt there will be a considerable amount of drainage work done in this county.

Along the upper part of Kishwaukee River in McHenry, Boone, and Winnebago counties there is a small amount of overflowed lands, some 5,000 acres in all, but the area is too narrow for anything but channel correction.

The topography of Kane County is irregular and slightly rolling. In the northern portion, are a great number of kettle holes, which for the most part are filled with peat, though some contain water.

The portion of Kane County which lies within the Kishwaukee watershed contains 10 drainage districts. Some of these districts, as Rutland District No. 1, are very old and the ditches are in need of cleaning and deepening. Some maintenance work is in progress here. With the exception of the northwest corner the county is well drained. West of Hampshire an area of some 13,000 acres needs more drainage. The county ditch which was dug by hand about 40 years ago, to drain this territory, is too shallow to provide outlets to tile drains and simply serves to carry off some of the flood waters. Just west of this area, in DeKalb County, the Coon Creek district is located, and the land owners in Kane County are anxious to improve the existing ditches and join them to those of the Coon Creek district. If the entire territory is annexed, the majority of the area of the district will be in Kane County and as a result, under Section 58 of the drainage law as amended in 1919, all the proceedings will be transferred automatically from the DeKalb County Court to that of Kane County. To avoid this only a portion of the wet area is proposed for annexation. It is proposed to construct a cut-off between the two creeks in Section 20 and thereby use the upper portion of the east creek for a drainage ditch. The portion through Section 17 will receive no attention, and will be outside the district. It is feared that the objectors will fight the construction of the cut-off on the ground that it would divert water out of its natural course.

The Coon Creek district at present contains 8,800 acres. It was organized in 1912 and construction was completed in 1914. It has 10 miles of open ditches and 3 miles of large tile. It is considered a successful district.

The land values have increased from \$100 an acre to \$250 an acre. However, they are not entirely free from overflow and some flooding was experienced in 1918.

On the west of the Coon Creek district, and just across a low divide, the Deer Creek district, containing 2,720 acres, was organized in 1918. The organization was complete and the assessment roll had been prepared by the commissioners; but through someone's oversight, the assessment roll was not filed. The objectors used this technicality as a basis for a suit which they won, with the result that the district was dissolved.

Efforts are now being made to re-organize this area. A wet area of about 2,900 acres in the northeast corner of Kingston township could be included in the Deer Creek district; also a narrow strip along the creek in sections 31, 28, and 33, Genoa township needs better drainage and might be included.

DeKalb County has no large streams. The ground is level or but slightly rolling, so that the natural drainage is poorly developed and many outlet streams have been dredged. South of Sycamore, practically all the areas along the streams are in drainage districts. Some of the few small wet areas remaining undrained are owned by men who are opposed to drainage work. All of such areas could be annexed to existing districts.

The Kishwaukee Special district organized in 1906, contains 3,840 acres and extends for a distance of about seven miles along the South Branch of Kishwaukee River and the creek which flows north and east of the city of Sycamore which is situated at about the center of the district. The ditch originally had a 10-foot bottom width but it needs enlarging. Eight organized districts, containing 26,000 acres of land, have their outlet through this ditch and as a result the Kishwaukee district is overflowed during flood periods.

Burlington No. 1, 1,510 acres; Burlington No. 2, 770 acres; Virgil No. 1, 3,920 acres; Virgil No. 2, 2,080 acres; and Virgil No. 3, 3,600 acres, cover the greater part of Virgil township and are all operating satisfactorily.

Union District No. 3, of Cortland and Virgil townships, Kane, and DeKalb counties, was organized in 1895. It embraces 8,220 acres and has constructed 15 miles of ditches. The main ditch has a bottom width of 16 feet and empties into the 10-foot ditch of the Kishwaukee Special. Although this area is overflowed nearly every spring, little damage results and the commissioners feel that the project has been successful. Abutting on the west of this district, is Union District No. 4 of Cortland and Pierce townships, which contains 2,000 acres; and joining the latter district is Union No. 1 of the same township, containing 4,080 acres. All of the above eight districts drain through the Kishwaukee. Along the South Branch of the Kishwaukee below DeKalb, four districts have been organized. The most easterly of these, the Union No. 1 of Afton and DeKalb townships, contains

2,560 acres and has its own outlet in the river below the other districts. The river flows through the center of Union No. 1 of Afton and Milan townships. This is a new district, having been completed in 1918. It has 9,600 acres within its boundaries, and is drained through 13 miles of ditches. In 1916 the land in this district sold for \$100 an acre; now it is priced at from \$250 to \$350 an acre. This is an excellent example of the financial benefits which are being received through drainage. Southwest of this district a wet area which comprises some 1,300 acres should be annexed either to this district or to the Union District No. 1 of Shabonna and Milan to the south. This latter district is 4,480 acres in extent and is at the extreme southern end of the Kishwaukee watershed.

Adjoining the above districts on the north and extending to the Chicago and Northwestern Railroad is the Union Special District of Milan, Malta, Afton, and DeKalb townships, which was completed in 1910, and includes 4,000 acres. Seven miles of ditches and about five miles of tile drain have been constructed. The district was overflowed in 1916 and 1917. On the whole the drainage received is good and the owners are satisfied with the results.

To the north of the railroad between Malta and DeKalb there are three districts: the Malta No. 1, 800 acres; the Union No. 1 of Malta and DeKalb, 2,000 acres, and the Normal district, 1,880 acres. The last named district completed three-quarters of a mile of open ditch and one mile of large tile drain in 1916. The land has increased from \$125 an acre to \$300. However, all of this increase is not the result of drainage, as all the land in this neighborhood has almost doubled in value since 1914.

There is need for a district to follow the South Branch of the river from the Union District No. 1, Afton and DeKalb, on the south to the Kishwaukee Special on the north. About 4,300 acres would be benefited by such a district.

North of Nichols an area of about 1,400 acres, and south of Wilkinson a similar tract of 1,800 acres need better drainage.

A considerable amount of drainage has been accomplished in DeKalb county through individual and mutual effort. As indicated on the map, the portion of DeKalb County in the Kishwaukee watershed has been drained rather completely.

In Ogle County there are two districts within this watershed. The Killbush Mutual is northeast of Rochelle, just across the watershed line from the Kyte River district. The area of this district is 1,920 acres. It was organized by mutual agreement, the cost being divided among the owners according to acreage. To the east of this district is an area of some 2,000 acres which would be greatly benefited by drainage.

In the northern part of Scott Township and extending into Winnebago

County, 3,920 acres have been included in the Kishwaukee district. The outlet is in the Kishwaukee River only a short distance from its mouth.

About 950 acres of overflow land along the river might well be annexed to the Kishwaukee district.

In the northeast corner of Ogle County an area of 2,300 acres of wet land could be improved by organized drainage.

Along the South Branch from about Kingston to its junction with the main river there is a narrow strip of overflowed land containing about 2,300 acres, which might be reclaimed.

To recapitulate, there are (1) thirty-one organized drainage districts with a total of 128,620 acres, (2) three districts in process of organization with a combined area of 8,400 acres, (3) 8,400 acres of overflowed lands, and (4) 24,700 acres of wet upland, which would be improved by drainage. It is estimated that about 4,000 acres within organized districts may still be classed as unreclaimed land. This added to the overflowed areas and the wet upland listed represents 22 per cent of the originally wet lands in the watershed remaining to be reclaimed.

CHAPTER VI—FOX RIVER WATERSHED

The Fox River watershed covers about 2,600 square miles, of which 1,630 are in Illinois. The river rises in Wisconsin about 35 miles north of the Illinois state line and flows south through Lake, McHenry, Kane, DeKalb, and LaSalle counties, emptying into Illinois River at Ottawa. According to the 1914-15 survey of the Rivers and Lakes Commission, the total length of the river channel in Illinois is 114.96 miles with a fall of 282.6 feet. Between the state line and the McHenry dam the fall averages 2.46 feet per mile. The rate of fall increases until above Ottawa it is 5.85 feet per mile. The natural fall of the river is broken by 14 dams ranging in height from 2.5 to 9.5 feet. These dams are not objectionable from the standpoint of drainage. The drainage data for this watershed are given in Table 7.

In Lake and McHenry counties the river flows through Channel, Marie, Grass, Fox, Nipersink, and Pistakee lakes, and many smaller lakes drain into it. The Rivers and Lakes Commission's report of 1914-15 states that the total lake area drained by the Fox River is approximately 40 square miles. In places through Lake County, the river flows through swamps covered with reeds, cattails and other swamp growth, and its identity as a river is practically lost.

On the map, along the Lake-McHenry County line, an area of some 25,000 acres is shown in green. The soil here is very irregular.¹ Small scattered areas of black mixed loam and larger areas of deep peat represent swamp and bottom land soils; and about equal areas of yellow-gray silt loam, which is an upland timber soil type, intervene.

The upper Fox River valley is quite a summer resort area. Many summer homes have been built along the many lakes, and large numbers of city people are attracted here during the hot summer months by the fishing and boating. Hence this area has a value for other than agricultural purposes, and there is strong opposition to drainage. But without doubt a large part of this area will eventually be reclaimed for farming purposes.

Owing to the decided fall of the stream and the character of the county through which it flows, the lower portion of the river has little or no bottom land subject to overflow except in extreme floods which in the past have occurred at intervals of about 20 years, and therefore no overflow land is listed in this watershed.

Besides the wet areas mentioned above, two other such areas in McHenry County would be benefited by drainage. One of these, located south of Richmond, contains 8,000 acres, and the other, situated north of Woodstock, covers about 7,500 acres. As there is some upland prairie around the edges not all the land included in these areas is wet; but all of it would probably

¹Univ. of Ill. Ag. Exp. Sta. Soil Report No. 9, Lake County.

be included in any organized effort to improve the drainage conditions. Most of the area is bottom land and the soil is a black mixed loam.

In both Lake and McHenry counties large tracts of tillable land are spotted with many small peaty areas which need drainage. Under the

TABLE 7.—*Drainage data for Fox River watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Greenwood No. 1.....	McHenry	2,320
1a	Hebron No. 1.....	McHenry	6,880
2	Union No. 1, McHenry and Munda.....	McHenry	1,040
3	Union No. 2, McHenry and Munda.....	McHenry	1,840
4	Union No. 1, Munda and Wauconda.....	McHenry-Lake	980
5	Grant No. 1.....	Lake	700
6	Union No. 1, Wauconda and Fremont.....	Lake	600
7	Slocum Lake.....	Lake	1,240
8	Dorr No. 3.....	McHenry	640
9	Crystal Lake.....	McHenry	1,380
10	Union No. 1, Rutland and Plato.....	Kane-McHenry	3,200
11	Union No. 1, Kaneville and Blackberry.....	Kane	4,680
12	Kaneville No. 1.....	Kane	1,400
13	Union No. 1, Kaneville and Pierce.....	Kane-DeKalb	2,000
14	Pierce No. 1.....	DeKalb	1,360
15	Union No. 1, Clinton and Afton.....	DeKalb	1,100
16	Big Rock No. 1.....	Kane	600
17	Big Rock No. 2.....	Kane	960
18	Sugar Grove No. 1.....	Kane	600
19	Blackberry No. 1.....	Kane	1,360
20	Lake Run, Blackberry and Batavia.....	Kane	2,600
21	Union No. 1, Aurora and Naperville.....	Kane-Dupage	880
22	Union No. 1, Kane and Kendall.....	Kane-Kendall	700
23	Rob Roy, Sugar Grove.....	Kane	2,000
24	Raymond.....	Kendall	1,270
25	Bristol No. 2.....	Kendall	410
26	Bristol No. 1.....	Kendall	2,020
26a	Morgan Creek.....	Kendall	1,470
27	Big Slough.....	Kendall	2,800
28	Union No. 1, Northville, Sandwich and Little Rock.....	Kendall-DeKalb-LaSalle	560
29	Somonauk No. 1.....	DeKalb	960
30	Union No. 2, Victor and Somonauk.....	DeKalb	1,440
31	Union No. 1, Victor and Somonauk.....	DeKalb	1,440
32	Victor No. 1.....	DeKalb	9,800
33	Wyoming.....	Lee-DeKalb	490
34	Earl No. 1.....	LaSalle	3,055
35	Union No. 1, Freedom and Earl.....	LaSalle	8,300
36	Union No. 1, Freedom and Ophir.....	LaSalle	1,270
37	Freedom No. 1.....	LaSalle	4,500
38	Union Special, Freedom, Wallace, and Dayton.....	LaSalle	2,200
39	Wallace No. 2.....	LaSalle	5,600
40	Union No. 1, Wallace and Dayton.....	LaSalle	3,200
	Total.....		91,845

TABLE 7.—*Drainage data for Fox River watershed—Concluded*

Refer- ence No.	Name of district	County	Area
<i>Districts being organized</i>			
42	Lake Villa No. 1.....	Lake	<i>Acres</i> 960
43	Squaw Creek.....	Lake	3,900
44	Wauconda.....	Lake-McHenry	4,650
45	Fox River.....	Lake-Cook-Kane- McHenry	8,840
46	Union No. 1, Sugar Grove and Aurora.....	Kane	1,670
	Total.....		20,020
<i>Wet areas</i>			
47	Along Fox River.....	Lake-McHenry	25,000
48	South of Richmond.....	McHenry	8,000
49	North of Woodstock.....	McHenry	7,500
50	Along Blackberry Creek.....	Kane	2,400
	Total.....		42,900

present system of tractor farming this is particularly desirable, for the wet areas so cut up the field as to make the use of tractors very difficult.

The only other area of land shown on the map which needs attention is northwest of Aurora. Here some 2,400 acres along Blackberry Creek would be benefited by the dredging of a straighter channel for the Creek. This is an improvement which might profitably be carried down as far as Yorkville, in Kendall County.

Six drainage districts with a combined area of 14,100 acres have been organized in this watershed in McHenry County. The names and areas are given in the table and their locations are shown on the map. With the exception of Dorr No. 3, all these districts have been constructed since 1912. The Dorr district is not entirely satisfactory and possibly should be included with the surrounding area, which is none too well drained, into one large district. Hebron District No. 1 is having trouble with seepage flow from the area across the state line in Wisconsin. An effort is being made to remedy this through the cooperation of the upper land owners. The other districts are operating satisfactorily.

Three small districts lie entirely within Lake County and a fourth district extends into McHenry County. The combined area of the four districts is 3,520 acres. They have all been organized since 1913. While they have been beneficial, they have not covered large enough areas. The Wauconda district, 4,650 acres, is now being organized in the area between three

of the small districts. In Lake Villa township, District No. 1, 960 acres, is in process of organization. To the south, along Squaw Creek, a district of 3,900 acres is being formed. A considerable amount of drainage in Lake County is needed and, due to the work of the County Farm Bureau, the drainage sentiment is much improved as evidenced by the fact that four districts (two in Des Plaines watershed) are now being organized.

In the northwest corner of Cook County and extending into McHenry and Kane counties, a district is being promoted which will be known as the Fox River district, and which will include about 8,840 acres.

All but the northwest corner of Kane County drains into Fox River. Eleven districts are located in this area, three of which extend into adjoining counties. They represent a combined area of 20,280 acres, and vary individually from 600 to 4,680 acres. So far as could be ascertained these districts are considered successful. Some of the older ones, such as Union No. 1 of Rutland and Plato, are in need of maintenance work.

One new district is organizing in Kane County, namely, Union No. 1 of Sugar Grove and Aurora, located just northwest of the city of Aurora.

Most of the land in Kane County has good natural drainage. The districts mentioned above have taken care of the more level areas and facilitated their drainage. However, there are many pot-holes and small swamps which can be drained by individual effort.

DeKalb County has seven districts in the Fox River watershed, besides Union No. 1 of Kaneville and Pierce which extends from Kane County. The combined area of the seven districts is 16,660 acres.

The land in Kendall County along Fox River is distinctly rolling, but away from the river it flattens out into good farming land. Little drainage work has been done in the county because the natural drainage is good. Along Blackberry Creek there is a narrow area of overflow due to the crooked channel. This stream is the outlet of numerous tile drains and the area benefited by its improvement might warrant the opening of a better outlet.

There are six organized districts in Kendall County with a total area of 8,670 acres. No new work is contemplated and there is no overflowed area.

The portion of La Salle County in the Fox River watershed is well drained through organized districts and individual tile lines to the natural outlets. Seven districts are listed in the table and shown on the map. Most of these were organized under the Farm Drainage Act and as some of the records could not be found, the boundaries of several may be in error. All of the districts are operating successfully, and the value of the land is between \$300 and \$400 an acre.

With the exception of the northern end, the Fox River watershed is well drained. The growing sentiment for drainage in the northern end will

undoubtedly result in more organized districts. There is no overflow problem in this watershed.

To recapitulate: (1) Forty-two districts with a combined area of 91,845 acres have been organized in the Fox River watershed; (2) five districts representing 20,020 acres are in process of organization; and (3) there are 42,900 acres of unreclaimed land. It is estimated that approximately 3,000 acres within organized districts may still be classed as unreclaimed land. This makes a total of 45,900 acres of such land which represents 30 per cent of the original area subject to reclamation.

CHAPTER VII—DESPLAINES RIVER WATERSHED

Desplaines River rises in Kenosha County, Wisconsin, and flows southward through Lake, Cook, and Will counties to its junction with the Kankakee River just west of the Will-Grundy county line. These two rivers form Illinois River. The drainage data for this watershed are given in Table 8.

TABLE 8.—*Drainage data for the Desplaines River watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Warren No. 1.....	Lake	1,080
2	Seavey Slough.....	Lake	1,010
3	Vernon No. 2.....	Lake	1,430
4	Palatine.....	Cook	4,560
5	Wheeling No. 1.....	Cook-Lake	5,100
6	Maine.....	Cook	1,680
7	Elk Grove.....	Cook	3,640
8	Bartlett.....	Cook	1,000
9	Bloomington No. 1.....	Dupage	1,190
10	Addison No. 1.....	Dupage	800
11	Addison.....	Cook	680
12	Wayne-Winfield.....	Dupage	2,160
13	Milton No. 4.....	Dupage	1,330
14	Milton No. 5 (Mutual).....	Dupage	1,280
15	Hesterman Mutual.....	Dupage	1,440
16	Naperville No. 2.....	Dupage	2,000
17	Naperville No. 1.....	Dupage	880
18	Union No. 1, Wheatland and Naperville.....	Will-Dupage	500
19	Eastern Lille Cache.....	Will	1,290
20	Joliet No. 1.....	Will	540
21	Union No. 1, Orland and Palos.....	Cook	1,300
22	Orland No. 2.....	Cook	1,100
23	Union No. 1, Bremen and No. 4 Orland.....	Cook	1,200
24	Union No. 1, Frankfort and Rich.....	Will-Cook	6,000
	Total		43,190
<i>Districts being organized</i>			
25	Avon and Fremont.....	Lake	4,500
26	Buffalo Grove.....	Cook-Lake	7,440
27	Arlington Heights.....	Cook	1,440
28	Weller Creek.....	Lake	5,600
28a	Addison Creek.....	Cook-DuPage	13,700
	Total.....		32,680
<i>Overflowed areas</i>			
29	Along Desplaines River.....	Lake	4,000

TABLE 8.—*Drainage data for the Desplaines River watershed—Concluded*

Refer- ence No.	Name of district	County	Area
<i>Upland areas needing drainage</i>			
30	North of Seavey Slough district.....	Lake	800
31	West of Bloomingdale.....	DuPage	1,000
32	East of Wayne-Winfield district.....	DuPage	3,000
33	Palos Township.....	Cook	1,500
	Total.....		6,300

In Lake County the grade of Desplaines River is irregular, as it flows through a series of flat swampy areas separated by stretches of greater slope. The swampy stretches are too narrow, for the most part, to justify much expense to secure protection from overflow. However, through the northern half of Lake County the overflowed width is about half a mile and the area is about 4,000 acres, so that the strip is a feasible drainage project.

No districts have been organized along the river in Lake County. In Warren Township, District No. 1, 1,080 acres, is located. The land owners are satisfied with the results of the undertaking and drainage sentiment in the neighborhood is good. In fact, just west of this area, the Avon and Fremont District, 4,500 acres, is now being organized. It includes the higher land along the watershed line, and is just across the watershed line from the Squaw Creek district which is also in the formation stage.

The Seavey Slough District, 1,010 acres, is southeast of Leighton. It was completed in 1910 and has proven successful. Just north of this district is a tract of wet land which needs draining and which might be annexed to the Seavey Slough District.

To the south, in Vernon Township, is District No. 2. It was organized in 1912, contains 1,430 acres, and has accomplished its purpose. Land values in the district have increased at least 50 per cent.

Some 7,440 acres in the southern part of Lake County and the northern part of Cook County were being organized into the Buffalo Grove District at the time the field work in these counties was in progress and is shown on the map. However, later information is to the effect that this district has been abandoned. The organization had reached the stage where the assessment roll had been submitted to the court, all the plans, specifications, and field work having been completed, when, owing to war prices, the land owners decided to abandon the district under section 44 of the drainage law as amended in 1919. After several months of litigation, the court ordered the district abandoned and effected a compromise between the district and the attorney, engineer, and other creditors of the district.

Lake County needs a large amount of drainage work. In the Desplaines watershed but few sections of land do not contain some wet and swampy areas. The interest shown by the County Farm Bureau has already done much to create a drainage sentiment and has led to the organization of the new districts in the county. Undoubtedly, many districts will be organized eventually.

Through Cook County the fall of the river is more uniform than in Lake County, and its channel is more definite. The river flows through a well-defined valley and has built a well-graded flood plain. About a mile north of Summit, the river, at one period of its history, flowed eastward into Lake Michigan. Later it cut a channel through the moraine to the west and discharged both to the east and the south. The Ogden dam was built to prevent the flow into Lake Michigan; but its crest is only 3.5 feet above low-water and in times of flood the water flows over the dam and through the Ogden ditch into Chicago River and thence to Lake Michigan. Due to this outlet, the floods on the lower river are not as large as those on the upper river. When the Chicago Sanitary Canal was constructed, Desplaines River was diverted to the west. Between Summit and Lemont the valley floor is so noticeably flat that it is known as the "12-mile level." The valley here is marshy and subject to overflow, but due to the Illinois and Michigan Canal, the Sanitary Canal, and the Desplaines itself, there is no opportunity for drainage reclamation.

It will be noted that on the map the watershed line between the Desplaines River and the Lake Michigan watersheds passes through the Chicago Sanitary District. The natural watershed has been taken rather than the artificial one, due to the fact that the benefits of the above mentioned district are almost entirely of a sanitary nature and that it gives comparatively little agricultural benefit. However, the entire area of this district is listed under the Lake Michigan watershed.

Exclusive of the Chicago Sanitary District, Cook County has ten organized districts in this watershed, three of which extend into adjoining counties.

The Palatine District was organized in 1915, but owing to high prices, construction work was delayed. With continued high prices, the land owners are discouraged and are now in court asking that the district be abandoned under section 44 of the drainage law. Not only does this area need drainage but also several thousand acres outside of its boundaries.

Adjoining the last named district on the southeast, a tract of 1,440 acres is being organized into the Arlington District; and farther southeast the Weller Creek District is in process of formation. The area in the latter district as proposed is 5,600 acres.

To the west, the Elk Grove District has been constructed along the headwaters of Salt Creek. It contains 3,640 acres and is giving satisfactory drainage.

The Wheeling District No. 1, 5,100 acres, in Cook and Lake counties, was organized with considerable opposition, but it has been so beneficial that little opposition now remains.

The Maine District, 1,680 acres, is located north of Park Ridge. Its organization has been affirmed by the Court, and the assessment has been spread, but no construction work has been done.

The Addison Creek District is one which is in process of organization. It is being organized in Cook County, though a portion of the district is in Dupage County. As proposed, it contains 13,700 acres and will be the largest district in the Desplaines watershed. Part of this district is in the Chicago Sanitary District. In the southern part of Cook County two small districts, namely, Union District No. 1 of Orland and Palos Townships, and Orland District No. 2, contain 1,300 acres and 1,100 acres respectively. The Union District, organized about 35 years ago, was evidently dissolved, and in 1916 was reorganized. Plans have been made for the new district, but no construction work has been done. About 50 per cent of the area within the district is not useful. Orland No. 2 was organized in 1881, and is not giving satisfactory drainage at present, as crops are frequently lost from overflow. The ditches have insufficient fall and silt up quickly, making the maintenance cost excessive. This district is at the upper end of a branch of Hickory Creek. Extending the district would be beneficial. The lower end of Hickory Creek is subject to occasional floods and will probably be incorporated in a district in time. Along the "Calumet Feeder" there is a considerable amount of swamp land. West of the village of Worth this area spreads out and makes a very feasible drainage project. An area of about 1,500 acres is shown on the map. For a width of about one-fourth mile along the "feeder" as far as Blue Island, swampy conditions exist.

South of Tinley Park an area of 1,200 acres was incorporated in 1913 into the Union District No. 1 of Bremen and No. 4 of Orland.

Union District No. 1 of Frankfort and Rich, in Cook and Will counties, contains about 6,000 acres. The boundaries of this district as shown on the map are only approximately correct.

All of Dupage County is within the Desplaines watershed. The natural drainage of this county is poorly developed. A number of small lakes and hundreds of small swampy areas, according to the County Advisor, aggregate about 10,000 acres. Two of the larger areas are shown on the map, one west of Bloomingdale, containing about 1,000 acres, and the other northwest of West Chicago, covering approximately 3,000 acres.

All the streams are small and occasionally overflow but the area is hardly large enough to justify much expense for reclamation. Possibly districts including the higher lands will be formed along these streams and the streams dredged to provide better outlets.

Nine small districts with a combined area of 11,200 acres have been organized in Dupage County.

In Will County, only two districts are included in this watershed, the East Lille Cache District, west of Romeo, and Joliet District No. 1, south-east of Joliet. The former contains 1,290 acres and the latter 540 acres. There has been a considerable amount of private drainage done in this county.

The drainage outlook in the Desplaines watershed is good. The old districts are comparatively small, averaging about 1,800 acres; the new ones are much larger and average about 6,500 acres. Undoubtedly other large districts will be formed. This area has suffered more than any other portion of the State through the operation of section 44 of the drainage law. As above mentioned several districts have been abandoned and others are seeking to disband. The engineers and attorneys for these districts have suffered considerable pecuniary loss, and will hesitate in the future to undertake drainage work on the contingent fee basis.

To sum up the situation in this watershed: (1) Twenty-four districts representing 43,190 acres have been organized; (2) five districts with a combined area of 32,680 acres are being formed; (3) approximately 4,000 acres of land are overflowed along Desplaines River; and (4) at least 6,300 acres of wet land outside of the river bottoms require better drainage. It is estimated that 7,000 acres within organized districts (including the Sanitary District) may still be classified as unreclaimed land. Of the land in the watershed originally subject to reclamation, 20 per cent remains unimproved.

CHAPTER VIII—LAKE MICHIGAN WATERSHED

The Lake Michigan watershed comprises 780 square miles and has the distinction of having the largest area in drainage and sanitary districts of any watershed in the State. This is because of the two large sanitary districts which have been organized along the Lake.

TABLE 9.—*Drainage data for the Lake Michigan watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	North Shore Sanitary.....	Lake	30,000
2	West Skokie.....	Lake	3,000
3	Vernon No. 1.....	Lake	680
4	Union No. 1, West Deerfield and Northfield.....	Lake	3,130
5	Union No. 1, Northfield and Deerfield.....	Lake-Cook	680
6	New Trier No. 1a.....	Cook	910
7	Chicago Sanitary.....	Cook	252,220
8	Union No. 2, Bremen and No. 3 Orland.....	Cook	4,400
9	Bremen No. 3.....	Cook	700
10	Monroe No. 5.....	Will	330
11	Deer Creek No. 3.....	Will	1,560
12	Crete No. 4.....	Will	860
13	Meyer.....	Will	1,320
14	Washington No. 2.....	Will	740
	Total.....		300,530
<i>Districts being organized</i>			
^a 15	East Skokie.....	Lake	2,360
^a 16	East Fork.....	Cook	5,000
^a 17	Westmoreland.....	Cook	1,200
18	Midlothian.....	Cook	11,500
19	North Creek.....	Cook	12,000
	Total.....		32,060
<i>Overflowed area</i>			
	None.....		
<i>Upland areas needing drainage</i>			
20	Upper end East Skokie.....	Lake	2,500
21	Upper end West Skokie.....	Lake	2,000
	Total.....		4,500

^aWithin Chicago Sanitary District.

The North Shore Sanitary District extends the entire length of Lake County and varies from one and one-half to three miles in width. Its area is approximately 30,000 acres. It was organized in April, 1914, and the commissioners, through their engineer, have prepared plans for the disposal of the sewage from the many villages and cities along the Lake front. However, the plans have not as yet been carried into effect.

The Chicago Sanitary District was organized by special Act of the Legislature in 1887. Its boundaries have been enlarged from time to time till now 253,130 acres are included in the district. It extends from the north line of Cook County on the north to the south boundary of the city of Harvey on the south. Its average width is about ten miles with a maximum width of 17 miles. Included in the district are forty-six incorporated villages and cities. The purpose of the district is "to provide for the disposal of sewage of the district by dilution and outlet into Illinois River, and to provide such other sewage disposal as shall preclude the contamination of the Lake Michigan supply."

The district has constructed a main channel from Robey Street, Chicago, to Lockport, a distance of 28 miles. In carrying out this work, Desplaines River was diverted for a distance of 13 miles. The main channel was extended in 1903-07 from Lockport to Joliet, a distance of 4.25 miles for the purpose of water-power development. In 1910, the North Shore channel was completed, extending from the Lake at Wilmette to the North Branch of Chicago River at Lawrence Avenue, a distance of 8.14 miles. The Calumet Sag Channel which is now under construction will connect Little Calumet River just east of Blue Island with the Main Channel at Sag. The length of this canal is 16.25 miles.

The principal purpose of the Chicago Sanitary District is sewage disposal and little, if any, attention has been given to agricultural drainage. Consequently, the agricultural areas in the outskirts of the district are not benefited from a drainage standpoint and several drainage districts have been and are being organized within the Sanitary District.

In Lake County, five drainage districts have been organized in the Lake Michigan watershed, and one is now being organized.

The West Skokie Drainage District, 3,000 acres, was completed in 1910. It is a long narrow district along the east fork of the North Branch of the Chicago River. It has been quite successful and the land has about doubled in value. It is subject to occasional overflow during heavy floods in the spring, but is free from excess water during the growing season.

North of the West Skokie District is an area of about 2,000 acres which might profitably be incorporated in a drainage district.

Adjoining the West Skokie District on the south is the Union District No. 1 of Northfield and Deerfield, completed in 1919. This is simply a continuation of the West Skokie District. It contains 680 acres, part of which is in the Sanitary District of Chicago.

Along the North Branch of Chicago River, west of the two last-mentioned districts, Vernon District No. 1 and the Union District No. 1 of West Deerfield and Northfield were both organized in 1910 and contain 680 acres and 3,130 acres respectively. Both districts are successful, though the lower one is subject to spring floods. The land along the ditch has increased from about \$100 an acre to \$200 an acre.

Along the Chicago and Northwestern Railroad in Lake County is an area about ten miles long and one-half mile wide, containing about 2,500 acres, which is wet and in need of drainage. The small stream through this area is known as the East Skokie. From the southern boundary of this area, as shown on the map, to the south line of Lake County, the wet area along this stream is now being organized into the East Skokie District; and where this district ends, the East Fork District is being formed in Cook County. The petition of the latter district has been filed. The East Skokie District will contain 2,360 acres, and the East Fork District 5,000 acres. The latter district is within the Chicago Sanitary District.

In New Trier Township, Cook County, District No. 2 has been organized, and, abutting it on the south, the Westmoreland District is being organized. The former district embraces 910 acres and the latter district 1,200 acres. Both are within the Chicago Sanitary District.

In the southern part of Cook County are located Union District No. 2, Bremen, and No. 3, Orland, and Bremen District No. 3, with a combined area of 5,100 acres.

Between the last-named districts and the Chicago Sanitary District, the Midlothian Drainage District is in an advanced stage of organization. It will contain approximately 11,500 acres, and as now proposed overlaps both the Sanitary District and Union No. 2 of Bremen and No. 3 of Orland.

In the extreme southeastern corner of Cook County, the North Creek Drainage District, 12,000 acres, has its petition about ready to submit to the Court.

Within the Lake Michigan watershed in Will County, there are five small organized districts. The largest of these contains 1,560 acres and the combined area is only 4,810 acres. All of these districts have been successful.

To recapitulate for this watershed: (1) Fourteen districts, containing 300,530 acres have been organized; (2) five districts are being organized at present with a combined area of 32,060 acres; (3) about 5,000 acres at present in organized districts which need better drainage; and (4) about 4,500 acres outside of districts would be greatly benefited by drainage. Only about 3 per cent of the area originally subject to drainage remains unreclaimed. This does not include areas which are now producing, but which would yield better and larger crops if tiled. No doubt as the need for land becomes more acute and the values increase, more districts will be organized in this watershed, particularly in the southern portion.

CHAPTER IX—KANKAKEE RIVER WATERSHED

The Kankakee watershed comprises about 2,150 square miles in Illinois and 2,220 square miles in Indiana. Kankakee River rises in St. Joseph County, Indiana, and flows southwesterly for about 80 miles, where it enters the State of Illinois about six miles east of Momence; thence through Momence and southwesterly to the mouth of Iroquois River near Aroma; thence northwesterly through the city of Kankakee to its junction with Desplaines River in Grundy County.

TABLE 10.—*Drainage data for the Kankakee watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Green Garden No. 1.....	Will	1,000
2	Union No. 2, Monee and Green Garden.....	Will	1,120
3	Union No. 1, Monee and Will.....	Will	1,480
4	Eagle Lake, Washington Township.....	Will	1,000
5	District No. 3, Washington.....	Will	3,880
6	Union No. 1, Washington and Yellowhead.....	Will-Kankakee	1,440
7	Union No. 2, Washington and Yellowhead.....	Will-Kankakee	2,380
8	Bartlett Mutual.....	Kankakee	1,140
9	Union No. 2, Sumner and Will.....	Kankakee-Will	2,360
10	Union No. 1, Will and Washington.....	Will	1,800
11	Union No. 1, Sumner, Manteno and Will.....	Kankakee-Will	1,400
12	Union No. 2, Sumner and Manteno.....	Kankakee	1,850
13	Manteno No. 3.....	Kankakee	2,600
14	Manteno No. 9.....	Kankakee	870
15	Union No. 10, Manteno and Peotone.....	Kankakee-Will	1,430
16	Union No. 1, Manteno and Peotone.....	Will-Kankakee	660
17	Union No. 3, Peotone (Gilkerson and Adams).....	Will	360
18	Union No. 2, Peotone and Wilton.....	Will	1,720
19	Rockville No. 3.....	Kankakee	1,200
20	Rockville No. 2.....	Kankakee	340
21	Rockville No. 1.....	Kankakee	1,200
22	Union No. 1, Florence and Wesley.....	Will	3,960
23	Shehan (Florence Township).....	Will	1,440
24	Wilmington Southern.....	Will	760
25	Roe Special.....	Kankakee-Will	3,260
26	Union No. 1, Salina and Essex.....	Kankakee	880
27	McGillivray.....	Kankakee-Will	4,900
28	North Limestone.....	Kankakee	2,370
29	Joe Benes.....	Kankakee	2,540
30	Raymond.....	Kankakee	2,160
31	Gar Creek.....	Kankakee	9,100
32	Minnie Creek.....	Kankakee	4,600
33	Grinnell Special.....	Kankakee	2,200
34	Union No. 5, Bourbonnais and Kankakee.....	Kankakee	1,060
35	Ganeer No. 5.....	Kankakee	1,600
36	Ganeer No. 3.....	Kankakee	400
37	Union No. 1, Ganeer and Bourbonnais.....	Kankakee	845
38	Union No. 6, Manteno and Bourbonnais.....	Kankakee	6,020

TABLE 10.—*Drainage data for the Kankakee watershed—Continued*

Refer- ence No.	Name of district	County	Area
			<i>Acres</i>
39	Union No. 1, Manteno and Bourbonnais	Kankakee	1,600
40	Union No. 7, Manteno and Bourbonnais	Kankakee	1,075
41	Manteno No. 11	Kankakee	780
42	Manteno No. 2	Kankakee	760
43	Manteno No. 12	Kankakee	640
44	Manteno No. 4	Kankakee	1,000
45	Union No. 8, Manteno and Sumner	Kankakee	460
46	Momence and Yellowhead	Kankakee	7,800
47	Momence and Pembroke	Kankakee	10,880
48	Union No. 2, Momence and Ganeer	Kankakee	2,320
49	Payne-Melby	Kankakee	1,050
50	Snake Creek	Kankakee	2,300
51	Spring Creek	Kankakee	7,040
52	Claussen Park	Kankakee	3,200
53	Little Beaver Special	Kankakee-Iroquois	13,920
54	Hopkins	Kankakee	12,320
55	Beaver No. 3	Iroquois	5,400
56	Big Beaver	Iroquois	9,120
57	Beaver No. 1	Iroquois	4,640
58	Martinton No. 3	Iroquois	19,820
59	Papineau No. 3	Iroquois	3,380
60	Union No. 1, Papineau and Martinton	Iroquois	4,400
61	Martinton No. 4	Iroquois	3,040
62	Ashkum No. 1	Iroquois	1,120
63	Union No. 1, Martinton and Iroquois	Iroquois	6,320
64	Iroquois No. 1	Iroquois	2,460
65	Middleport No. 1	Iroquois	7,880
66	Martinton No. 2	Iroquois	13,820
67	Beaver No. 2	Iroquois	4,790
68	Blackson	Iroquois	5,020
69	North Sheldon and South Concord	Iroquois	5,460
70	Eastburn No. 2	Iroquois	1,370
71	Eastburn No. 3	Iroquois	1,300
72	Eastburn No. 1	Iroquois	3,480
73	Sheldon No. 1	Iroquois	760
74	Sheldon Mutual	Iroquois	1,900
75	Possum Trot	Iroquois	11,040
76	Belmont No. 1	Iroquois	700
77	Crescent No. 1	Iroquois	5,400
78	Union No. 2, Crescent and Iroquois	Iroquois	2,440
79	Union No. 1, Iroquois and Crescent	Iroquois	5,140
80	Onarga, Douglas, and Danforth Special No. 1	Iroquois	15,680
81	Danforth No. 3	Iroquois	9,910
82	Milks Grove Special	Iroquois	9,200
83	Union No. 1, Ashkum and Danforth	Iroquois	20,880
84	Lahogue	Iroquois	13,160
85	Union No. 1, Onarga and Ridgeland	Iroquois	3,800
86	Union No. 2, Onarga and Ridgeland	Iroquois	810
87	Onarga No. 3	Iroquois	610
88	Onarga No. 2	Iroquois	1,760
89	Onarga No. 4	Iroquois	2,590
90	Onarga No. 5	Iroquois	1,300
91	Prosperity	Iroquois	1,580
92	Union No. 1, Ridgeland and Artesia	Iroquois	800
93	Union No. 2, Ridgeland and Artesia	Iroquois	800
94	Harmony	Ford	920
95	Union No. 1, Lyman and Wall	Ford	5,640

TABLE 10.—*Drainage data for the Kankakee watershed—Concluded*

Reference No.	Name of district	County	Area
			<i>Acres</i>
96	Artesia No. 4.....	Iroquois	6,820
97	Pond Lily.....	Iroquois	9,350
98	Fountain Creek No. 1.....	Iroquois-Vermilion	5,500
99	Union No. 1, Butler and Fountain Creek.....	Vermilion-Iroquois	2,720
100	Rankin.....	Vermilion	960
101	Reilly.....	Vermilion	900
	Total.....		392,360
<i>Districts being organized</i>			
102	Bourbonnais Mutual.....	Kankakee	1,700
103	Beaver No. 3 extension.....	Iroquois	7,760
104	Coon Creek.....	Iroquois	7,080
105	Union No. 1, Fountain Creek and Pidgeon Grove..	Iroquois	1,120
	Total.....		17,660
<i>Upland areas needing drainage</i>			
106	Area north of Monee.....	Will	1,500
107	Old Canavan.....	Kankakee	3,400
108	Southeast Corner Rockwell Township.....	Kankakee	1,000
109	Custer and Reed.....	Kankakee	3,680
110	Salina and Limestone Townships.....	Kankakee	8,100
111	Gar Creek extension.....	Kankakee	6,000
112	Minnie Creek extension.....	Kankakee	9,640
113	Area west of Fountain Creek Dist.....	Iroquois-Vermilion	11,680
114	Area surrounding Union No. 1, Butler and Fountain Grove.....	Vermilion-Iroquois	23,000
	Total.....		68,000

The principal tributaries are Yellow River in Indiana and Iroquois River in Illinois.

The Kankakee valley is divided into two basins by a ledge of limestone which crosses it between Momence and the State line. The upper basin is approximately level, the river having a fall of about 6 inches to the mile, and originally about 400,000 acres in this basin was a large swamp. Below Momence the valley is entirely different. While the country is flat, there are no swamps of any magnitude, and the banks of the river are high enough to prevent overflow, except in extreme floods.

Because of the large amount of swamp land involved, the State of Indiana has given some assistance in remedying the situation. In 1889 the Legislature of that State made an appropriation of \$40,000, and in 1891 an additional sum of \$25,000 was given. With this money the channel of the river at Momence was widened to 300 feet, and deepened 2.5 feet for a dis-

tance of 8,650 feet. This work was completed in 1893. Since then Indiana has given no more assistance in the reclamation of this area, but a movement is on foot to ask the 1921 Legislature for more assistance.

Since 1893, the drainage of the higher lands at the upper end of the watershed in Indiana has proceeded, and the upper half of the river has been straightened through organized districts, which has resulted in the serious flooding of the lower half of the Indiana watershed where the river channel is shallow and crooked. Since the Momence ledge holds back the flood waters, the eastern part of Kankakee County suffers from the water flowing in from Indiana.

The land owners in Indiana secured the assistance of the Drainage Investigations Division of the U. S. Department of Agriculture, by whom a survey was made in 1905 and 1906, and a report was issued in 1909, which contained plans for reclamation. These plans provided for the lowering of the Momence ledge another 2.5 feet. However, no steps have been taken toward carrying out these plans.

In Illinois, the Momence and Yellowhead Union District No. 1 was organized in 1912 for draining 7,800 acres of swamp land north of the river, between Momence and the State line. Nineteen miles of open ditches and six miles of large tile drains were completed by 1915. There are lands outside the district which should be annexed. The commissioners state that the district is not subject to overflow and that all the lands have adequate outlets.

On the opposite side of the river is Union District No. 1, of Momence and Pembroke, the area of which is 10,880 acres. Its drainage works consist of 8 miles of open ditches. The project has not been entirely successful. According to the commissioners, about 65 per cent of the land is not well drained, due to the fact that the main ditch was not dredged deep enough. The Momence ledge causes a high water-table throughout the district. The commissioners are planning to improve the ditches and some consideration has been given to the lowering of the rock ledge about two feet for a few hundred feet at its highest point.

Between these two districts the river bottom is about one mile wide for a length of about five miles. There are about 3,000 acres in this strip along the river. Because of the large volume of Indiana water and the consequent need of a wide floodway, little of this land can be reclaimed, and none can be reclaimed without lowering the Momence ledge. This would also result in greater flood flows in the river below Momence which might be injurious to the deep waterway now under construction along Illinois River. This is a factor which must be considered before the State gives permission for any agency to lower the ledge. However, if no objections are found on this score, the improvement might be brought about by the cooperation of the two states.

Twenty-eight per cent of the Illinois area in the Kankakee watershed

is in organized drainage districts. The map shows the location and distribution of these districts, and Table 10 gives their names and areas. A total of 101 districts has been formed with a combined area of 392,360 acres. Four districts are now in the process of organization with a total area of 17,660 acres.

No overflowed areas are listed for this watershed, though the area east of Momence might properly have been so given. Also along Iroquois River, which has a rock bottom, there is some flooding at times. Some of the larger creeks also occasionally overflow because of inadequate outlet.

Below Momence, Kankakee River has a fall of about 2.5 feet per mile. Several dams have been built across the stream, but they are not objectionable from a drainage standpoint. One is located at Aroma and another at Kankakee. The latter is used for power development.

North of Kankakee River the districts are comparatively small, and more scattered than they are south of the river. Most of them are under 2,000 acres in area. The Union District No. 1 of Momence and Yellowhead above mentioned is the largest of those north of the river. The value of the land in these districts varies from \$225 to \$350 an acre. All of these districts are successful and drainage sentiment is good.

North of the city of Kankakee, an area of 1,700 acres is now being organized into the Bourbonnais Mutual. North of this area, in the southeast corner of Rockwell Township, there is an area of 1,000 acres which needs more drainage and a district is being proposed. This area is shown in green on the map, reference number 108.

Northeast of Momence an area of 3,400 acres is shown in green. This is the land covered by the petition of the Canavan District which failed to perfect its organization.

North of Monee is another wet area which would be improved by drainage.

South of Kankakee River the districts are much larger, and adjoin each other to a large extent. It is not thought necessary to mention each of these districts individually since most of them are providing satisfactory drainage, and since their names, magnitudes, and locations are given in the table or on the map. Hence only the larger ones or those which are of interest for other reasons will be discussed.

Southwest of the city of Kankakee the Gar Creek District was organized in 1878. It has been enlarged from time to time and new work done. The final construction work was completed in 1914. It contains 9,100 acres and in all six miles of open ditches have been dredged and seven miles of tile drain have been laid. Southwest of the district is an area of about 6,000 acres which would be improved by drainage and which might be annexed to this district. The Minnie Creek District joins the Gar Creek District on the south. This district comprises 4,600 acres and there is talk of enlarging it

by taking in an area of about 9,600 acres on the south. This area, as well as the one to the west, is shown in green on the map. This land is all cultivated and producing crops but would be benefited by more thorough drainage.

The North Limestone Drainage District (No. 28 on the map) has done no construction work as yet. The district was organized without any special difficulty, the commissioners were appointed, and the assessment roll was filed. At this stage in the proceedings the objectors began their fight. They first tried to get their assessments reduced, but were unsuccessful. They next assailed the engineer's estimate, stating that the amount of rock excavation given in it was too low. Investigation of this matter upheld the engineer's estimate. They then circulated a petition to abandon the district, but were unable to secure the requisite number of signatures. At present they are in court, objecting to the organization of the district on the grounds that the engineer's fee is too high. So far, construction work has been delayed a year. However, it is the general opinion that the district will win out in its fight.

The Little Beaver Special District, 13,920 acres, was organized in 1911, but experienced considerable opposition, and was not completed until 1918. It has not been entirely successful, and some of the lower parts of the districts are not well drained. Considerable internal friction has increased the cost of the project and prevented the best results.

Martinton District No. 3, one of the oldest and largest districts in the watershed, was organized in 1880, and now contains 19,820 acres. Thirty miles of open ditches and twenty miles of large tile drains have been constructed. Its outlet is in Iroquois River which at times causes a small amount of flooding in the lower end of the district. However, but little land is not well drained, and the district is considered a successful one.

All of the districts along Iroquois River are subject to flooding during high water stages. Such flooding occurred in 1902, 1904, and 1914. The overflowed areas along the Iroquois are in small pockets which do not warrant reclamation on a large scale.

Eastburn District No. 2 has been only partly satisfactory, because the tile drains were not large enough. Part of the district is flooded nearly every year and the commissioners are contemplating improvements.

Union District No. 2 of Crescent and Iroquois townships was organized in 1893 and additional work was completed in 1908. The land is valued at about \$225 an acre. Of the 2,440 acres in the district, about 500 acres are not useful. The district has not given the drainage expected since the upper end of the ditch fills with quicksand and the lower end needs deepening. Also the main ditch should be continued to the river, and certain adjoining areas should be annexed.

Surrounding the city of Gilman is the Special District No. 1 of Onarga, Douglas, and Danforth townships, completed in 1888, and including 15,680

acres. The low areas in the district are overflowed by heavy rains due to silting up of ditches. The ditches were cleaned out in 1902, and the commissioners are now planning to clean them again. The land in this neighborhood is valued at from \$300 to \$350 an acre.

Union District No. 1, Ashkum and Danforth townships, embraces 20,880 acres and is the largest one in the watershed. It consists of 35 miles of ditches and 10 miles of tile drains which were completed in 1886. The district is giving complete satisfaction.

In the northeastern corner of Iroquois County a new area is being annexed to Beaver District No. 3 (No. 55 on map). This area is in two parcels; one on the north containing 2,700 acres which is shown on the map with reference number 103; and the other on the west containing 5,060 acres, which, through error, is not indicated on the map.

North of Milford, the Coon Creek District is being organized, with a proposed area of 7,080 acres.

In the southern part of Iroquois County, Union District No. 1 of Fountain Creek and Pidgeon Grove townships, involving an area of 1,120 acres, is in process of formation.

North of Rankin, an area of approximately 11,700 acres presents a possible drainage project. Drainage sentiment in this community is divided. One of the commissioners of Fountain Creek District No. 1 states that he has been asked many times to assist in organizing a district in this area and had not done so because of the amount of work required to organize a district under the drainage law.

To the east of the Fountain Creek District No. 1 is a still larger area, 23,000 acres, which needs better drainage and which might form several districts. The commissioner above referred to made a similar statement regarding part of this area.

Southwest of Custer Park, Will County, the land is badly in need of drainage. Part of this area was included in Union District No. 1, Custer and Reed townships, which failed in its attempt to organize. This area is shown in green as area No. 109 on the map.

Northwest of Kankakee is another wet area (No. 110 on map) for which plans of organization are being made. This is shown on the map in green rather than blue since the plans have not proceeded far enough to place this area in the latter classification.

In conclusion, it may be said that, although a large amount of drainage work has already been done in the Kankakee watershed, areas still remain which, although producing, are in need of better drainage and which will undoubtedly be incorporated into drainage districts eventually. Not only the areas shown in green come under this statement, but also other areas not so indicated.

It is estimated that approximately 4,000 acres within organized districts need further attention, making a total of 72,000 acres of such land. This represents 15 per cent of the watershed area originally subject to drainage.

CHAPTER X—VERMILION RIVER WATERSHED¹

The Vermilion watershed covers parts of Iroquois, Ford, Livingston, McLean, and La Salle counties, and comprises approximately 1,290 square miles of area.

This watershed is in the "corn belt" area and it is level to slightly rolling. The streams lie in shallow valleys and there is not much change in the topography or soils adjacent to them. The North Fork of Vermilion River has its source in Ford County, in T. 25 N., R. 9 E. It flows in a general northerly direction for about ten miles where it turns west and enters Livingston County, where after flowing for 15 miles, it is joined by South Fork which also has its source in Ford County in T. 25 N., R. 8 E. The river then flows northwesterly through Pontiac and Streator and empties into Illinois River opposite La Salle.

Almost the entire watershed in Iroquois and Ford counties has been drained. Five districts with a combined area of 47,160 acres empty their waters into North Branch about three miles west of the Livingston-Ford county line.

The largest of these districts is the Vermilion Special, containing 36,460 acres, which was organized in 1880. From the standpoint of design, construction, and organization, this is one of the best districts in the State. The commissioners state that there has never been any litigation in the district and that every dollar of assessment has gone into the drainage works of the district. This is unusual for so large a district. There are 36.5 miles of ditches which are of ample capacity and which have been well maintained. Nevertheless, during flood periods the lower end of the district is subject to overflow because of very inadequate outlet into the river whose channel is much smaller than the main ditch of the district. The river overflows its banks almost to Pontiac and causes considerable crop losses.

The commissioners of the Vermilion Special are cooperating with the owners below, and the North Vermilion District is now being organized. This district is about four miles wide for most of its length and extends for 18 miles along the river. It will contain 37,220 acres. This is a much-needed improvement, giving as it does an outlet to the districts which have already been formed and to those areas which have been deterred from combined drainage due to insufficient outlet.

To the north, the Bergman-Goodman-Taylor District drains 2,760 acres into the Vermilion District.

Union Drainage District No. 1, Pella and Brenton, embraces 10,200 acres along the upper end of North Fork. This district was organized about 1883 and has constructed 19 miles of ditches varying from 20 to 60 feet in

¹Into Illinois River.

width. The ditches were redredged in 1904 and again in 1918 and are in first-class condition. Its outlet is in the Vermilion Special.

Pella Township Districts No. 1 and No. 2 cover the area between the last two mentioned districts. The Vermilion Special District overlaps both of the Pella Districts.

All of these districts suffer from a lack of sufficient outlet and will be greatly benefited by the new district to the west.

TABLE 11.—*Drainage data for the Vermilion River watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Farm Ridge No. 1.....	La Salle	1,200
2	Allen No. 1.....	La Salle	1,070
3	Richland Mutual No. 1.....	La Salle	900
4	Richland Mutual No. 2.....	La Salle	1,100
5	Union No. 1, Reading and Osage.....	Livingston-La Salle	1,410
6	Reading No. 1.....	Livingston	1,350
7	Reading No. 2.....	Livingston	250
8	Union No. 1, Long Point and Reading.....	Livingston	1,960
9	Union No. 2, Long Point and Groveland.....	Livingston-La Salle	3,100
10	Long Point No. 2.....	Livingston	1,000
11	Long Point Mutual No. 1.....	Livingston	600
12	Long Point No. 3.....	Livingston	1,280
13	Long Point No. 1.....	Livingston	4,50
14	Pontiac No. 1.....	Livingston	15,400
15	Owego.....	Livingston	1,204
16	Union No. 2, Eppard's Point and Pontiac.....	Livingston	1,240
17	Union No. 3, Eppard's Point and Pontiac.....	Livingston	860
18	Eppard's Point No. 2.....	Livingston	810
19	Eppard's Point No. 4.....	Livingston-McLean	1,000
20	Union No. 1, Eppard's Point and Pike.....	Livingston	960
21	Eppard's Point No. 3.....	Livingston	630
22	Farmer's Co-operative.....	Livingston	7,320
23	Golden Rule.....	McLean-Livingston	11,300
24	Yates.....	McLean	11,300
25	Travis.....	McLean	1,690
26	Belle Prairie.....	Livingston-McLean	5,890
27	Roth Mutual.....	Livingston	600
28	Oliver and Corn Grove.....	Livingston	3,000
29	Monahan Mutual.....	Livingston	1,500
30	Charlotte Mutual.....	Livingston	980
^a 31	Union No. 1, Pella and Brenton.....	Ford	10,200
^a 32	Pella No. 2.....	Ford	2,840
^a 33	Pella No. 1.....	Iroquois-Ford	5,080
34	Vermilion Special.....	Iroquois-Ford-Livingston	36,480
35	Sullivan No. 2.....	Livingston	2,420
36	Bergman-Goodman-Taylor.....	Iroquois-Ford	2,760
	Total.....		134,240

^aPartly in Vermilion Special District.

TABLE 11.—*Drainage data for the Vermilion River watershed—Concluded*

Reference No.	Name of district	County	Area
<i>Districts being organized</i>			
37	Eagle Lake Special.....	La Salle	<i>Acres</i> 2,900
38	Reading Mutual.....	Livingston	1,040
39	Union No. 3, Long Point and Nebraska.....	Livingston	2,480
40	North Vermilion.....	Livingston	37,220
41	Eppard's Point and Avoca.....	Livingston	5,800
42	Avoca and Indian Grove.....	Livingston	5,260
	Total.....		54,700

West of Cullom, in Sullivan Township, is situated District No. 2 which was completed in 1919 and contains 2,420 acres. This area was flooded yearly before the ditches were dug, but now has thorough drainage. Before 1916, the land was valued at \$200 an acre; now the value has increased to \$350 an acre. There are other areas to the west which could profit through organized drainage.

To the east of Charlotte, Livingston County, the Charlotte Mutual drains some 980 acres; and to the west of Charlotte 1,500 acres have been organized into the Monahan Mutual. Parts of both these districts are included within the proposed boundaries of the North Vermilion District.

Only one district has been organized along South Fork, namely, the Oliver and Corn Grove District in the southeastern corner of Livingston County. There are 3,000 acres here which are drained through ten miles of open ditches and one mile of large tile. The district was completed in 1901 and as a result of drainage the land has increased in value to about \$300 an acre. The district was overflowed in 1904 and 1916.

In T. 25 N., R. 7 E., along Indian Creek, portions of sections 6, 7, 8, 9, and 10 are flooded during heavy rains and at times the crops are drowned out. The sentiment is that Indian Creek should be dredged to provide a better outlet for the area through which it flows.

In the southwestern corner of Livingston County there are three districts which empty into Indian Creek. The largest of these is the Belle Prairie District at the upper end of the watershed. It is partly in Livingston and partly in McLean County and contains 5,890 acres. It was completed in 1915 and consists of 7 miles of ditches and 7 miles of large tile. The success of this district has created a very favorable sentiment for drainage and it is only a matter of time till all lands in this neighborhood will be incorporated into districts.

The Roth Mutual is a small district of 600 acres just north of the Belle Prairie District. It has its outlet in Indian Creek and is a tile district. There

is a growing sentiment in this territory to use large tile drains whenever possible in place of small open ditches. The Travis District, organized in 1918, is the third district along Indian Creek. It drains 1,690 acres through two miles of open ditches and two miles of large tile.

Practically all the land south of Pontiac in Ts. 26 and 27 N., R. 5 E., is in drainage districts. The six districts at the northern end of this tract are small, having a combined area of 5,500 acres. However, the three districts at the southern end are comparatively large ones. The Farmers Cooperative District contains 7,320 acres, was organized in 1917, and is still under construction. The Golden Rule District, Livingston and McLean counties, and the Yates District, McLean County, each comprise 11,300 acres. All of these districts are accomplishing their purpose.

Northwest of Fairbury two large districts are being formed. They are the Union District of Eppard's Point and Avoca, 5,800 acres, and the Union District of Avoca and Indian Grove, 5,260 acres.

East of Pontiac, the Owego District was organized in 1915 and completed in 1916. There are 4,120 acres in this area. The drainage works consist of five miles of ditches and 3.5 miles of large tile. Some of the land in this district increased in value \$100 an acre, due to the improvement. The commissioners state that, while their district contains all the lands that it should, there is a considerable amount of near-by land which should be formed into districts. The sentiment here is also for tile drains where possible, as it has been found that small open ditches silt up quickly and require constant maintenance to keep small tile outlets open.

The names of three districts in Livingston and Ford counties were obtained, but no definite information could be secured concerning them. These are Sullivan District No. 1, Union District No. 1 of Mona, Pella, and Sullivan townships, and the "Ottmiller" District. A large amount of private tiling has been done in Livingston County and a number of small mutual districts have been constructed of which there is no record. Hence the total area in drainage districts as given for this county is too small.

North of Pontiac, District No. 1 has drained 1,540 acres. To both the northeast and northwest of this district are areas of land which have tight clay sub-soils and are badly in need of drainage.

Around Long Point, nine small districts have been constructed, and one is now being formed.

West of Streator, two small districts are in process of organization.

In LaSalle County, within the Vermilion watershed, very little drainage work has been done through organized effort. Only four small districts of about 1,000 acres each were located and these were organized under the Farm Drainage Act. However, a large amount of individual drainage work has been done and possibly some through mutual districts. The upland areas are flat and have poor natural drainage. Nevertheless the soil responds

readily to tile drainage, and the county seems to be well drained. The river has cut a deep channel and there is practically no land subject to overflow—only a few pockets here and there.

No overflow areas are shown for this watershed, since the North Vermilion District will take care of the only important area of this kind. While some of the creeks get out of their banks at times, the width of overflow is narrow and does not furnish a serious problem. In every such case the organization of a local district will remedy the situation.

Thirty-six districts, having a total area of 134,240 acres, are listed in Table 11 and shown on the map. A few small districts were not located.

Six districts having a combined area of 54,700 acres are in process of organization.

Livingston County offers a fertile field for future drainage work. The soil is very rich and when well drained has a value of about \$350 an acre. A large amount of land whose present value is around \$200 an acre could be profitably drained through organized effort.

A drainage engineer in this county stated that better drainage is the principal need from an agricultural standpoint, and that with reasonable business conditions the work to be done in the next ten years far exceeds that already done. According to this same authority, two wet areas of about 3,500 acres each in Reading Township are badly in need of drainage.

The county superintendent of highways advises that at least ten areas of about 2,000 acres each should be drained.

The county farm advisor states that a large amount of land in the county is somewhat in need of drainage and would be materially improved by better outlets.

From the above statements it is safe to predict that considerably more drainage work will be done in this county within the next few years.

There is a strong sentiment in favor of the simplification of the drainage laws. Rather than organize under the law, a large amount of drainage has been done through mutual districts. While objections to the drainage law in every county were investigated, there was an unusual amount of comment voiced in Livingston County.

CHAPTER XI—MACKINAW RIVER WATERSHED

The Mackinaw watershed comprises 1,120 square miles of territory situated in Ford, McLean, Livingston, Woodford, Tazewell, and Mason counties.

The principal tributaries of Mackinaw River are Henline Creek, Panther Creek, and Money Creek.

There is no serious overflow along Mackinaw River. In McLean County the bottoms are rarely over one-fourth of a mile in width, but in Tazewell County they vary from one to two miles. However, most of it is second bottom which is overflowed only by the higher spring floods. The Tazewell County Farm advisor states that it is very seldom indeed that corn crops are lost on this land; hence no overflow is shown on the map for this river. The drainage data for this watershed are given in Table 12.

TABLE 12.—*Drainage data for the Mackinaw River watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Sullivant	Ford	2,120
2	Mackinaw	McLean-Ford	5,460
3	Lawndale and Cropsey	McLean-Ford	11,020
4	Chenoa	McLean-Livingston	11,740
5	Gridley No. 1	McLean	7,680
6	Panther Creek	McLean-Livingston- Woodford	11,400
7	Normal and Towanda	McLean	1,810
8	Union No. 1, Sand Prairie and Cincinnati	Tazewell	1,580
9	Sand Prairie No. 1	Tazewell	2,100
10	Hickory Grove	Tazewell-Mason	8,120
11	Spring Lake No. 1 (Parkland)	Tazewell	1,190
12	Union No. 1, Cincinnati and Spring Lake	Tazewell	2,160
	Total		66,380
<i>Upland areas needing drainage</i>			
13	Lexington-Lawndale ^a	McLean	2,460
14	Area in Green Township	Woodford	7,000
	Total		9,460

^aFailed to organize.

The soil is for the most part a brown silt loam, spotted with small areas of black clay loam which need drainage as the first requisite to good pro-

duction. The soil responds well to tile drainage and a large amount of private work has been done. The drains have their outlets in numerous small shallow streams. Organized drainage is needed mainly to open up these shallow channels to provide more adequate outlets, and all the districts which have been formed are along the creeks, which have been dredged to provide better outlets.

At the upper end of the watershed in Ford County, the Sullivant Township District, 2,120 acres, was organized in 1907.

The Mackinaw District, 5,460 acres, was organized in 1913 but construction work was held up for five years because of litigation which was at last decided in favor of the district by the Supreme Court. Its plans are to dredge the channel of Mackinaw River for a distance of about eleven miles at its upper end. A part of this district is in Ford County. The commissioners state that there are some adjoining areas which should be annexed.

The Lawndale and Cropsey District contains 11,020 acres along Henline Creek, which has been dredged for about 18 miles. The district was completed in 1910 and is quite successful as evidenced by the fact that the commissioners place a value of \$400 an acre on the land. The eastern three miles of this district are in Ford County.

The Chenoa District contains 11,740 acres in McLean and Livingston counties. It was organized in 1918, but is not yet constructed.

In Gridley Township, District No. 1 drains 7,680 acres along the creek which has its source in the northern part of that township.

North of the above area, the Panther Creek District is just starting construction work. Its organization was confirmed in 1915, but the objectors held up the work for about five years. It contains 11,400 acres along the East Fork of Panther Creek in Livingston, McLean, and Woodford counties. One of the commissioners states that after the completion of the district the land will be worth \$500 an acre.

North of Normal, at the upper end of Sixmile Creek, the Normal and Towanda District provides drainage for 1810 acres.

In the extreme western portion of the watershed, five districts have been constructed in the Mackinaw River bottoms. Four of these districts are small, ranging in size from 1200 to 2100 acres. The fifth, or Hickory Grove District, contains 8120 acres, partly in Tazewell and partly in Mason County.

In all, twelve districts are shown for the Mackinaw watershed with a total area of 66,380 acres. There may be a number of small mutual tile-districts which are not indicated. A large amount of drainage has been done, but whether this was all private drainage or whether it was accomplished through mutual effort was impossible to determine.

No new districts are being promoted in this watershed.

South of Lexington is an area, shown in green on the map, representing

the land included in the Lexington-Lawndale District which failed to organize due to error by Court which caused loss of jurisdiction. There are 2460 acres in this tract, the owners of which will probably make a second attempt to organize.

The topography of the southern part of Woodford County is rolling to broken and has good natural drainage, but Greene and Panola townships at the upper end of the Mackinaw watershed have much flatter land. Considerable tiling has been done here and many owners are satisfied. However, some difficulty is developing because main tile lines are found to be too small for desired extensions. In all probability, districts may be formed to remedy this difficulty, although it can not be said that the lands are wet, unproductive, or even seriously handicapped by poor drainage. The area shown in green in Greene Township is one which will be benefited by combined drainage and where there is some sentiment toward organization.

CHAPTER XII—ILLINOIS RIVER WATERSHED

Illinois River is the largest and most important stream within the State, draining as it does almost one-half of the entire area of the State, as well as small portions of Indiana and Wisconsin. Illinois River proper has its source at the confluence of Kankakee and Desplaines rivers, near the east line of Grundy County; and in this report the Illinois River watershed is considered as commencing at that place.

The larger tributaries of the Illinois are Fox, Vermilion, Mackinaw, Spoon, and Sangamon rivers, and Crooked and Macoupin creeks. The watershed of each of these streams is treated under a separate chapter in this report.

Illinois River watershed, as outlined on the accompanying map, contains 6,940 square miles.

For a distance of 63 miles below its head, the Illinois flows westward. At this point, known as the "Great Bend," the river makes a right-angle turn and flows southward. Here a marked change takes place in the characteristics of the valley. The upper portion is rather uniformly about one and one-half miles wide, and is bordered with rocky bluffs except around Morris, where there is a flat basin. Near Seneca the valley narrows to about one-quarter of a mile. The total fall in the 63 miles is about 50 feet, or an average of 0.8 foot per mile. However, most of the fall occurs at the Marseilles dam, and the Starved Rock rapids. The bottom lands above La Salle are for the most part comparatively high and have a gradual upward slope to the bluffs. The duration of floods in this part of the valley is short and no levees have been constructed to protect the lowlands.

In the lower valley, below the bend, the rocky bluffs disappear and the flood plain widens to from two to six miles. The length of this portion is about 215 miles and the fall of the river only about 25 feet, which makes an average fall per mile of only 1.4 inches. There are four dams across the river in the lower valley. The Henry dam and lock was constructed under authority of an act of the General Assembly in 1867 for the purpose of aiding navigation. It was completed in 1871, and its crest is 6.5 feet above the low water of 1871. The Copperas Creek dam, between Pekin and Havana, was also authorized by the Legislature in 1873 for the same purpose. It was completed in 1877, and its crest is 6.25 feet above the low water of 1873. The La Grange dam and lock, below Beardstown, was constructed by the Federal Government in 1890 with its crest 7.4 feet above the low water of 1879. The Kampsville dam and lock was also constructed by the Government in 1893 and is 7.7 feet above the low water of 1879. The crest of this dam was lowered two feet by the Chicago Sanitary District in 1904-6 to relieve the overflowed lands somewhat. Work of

a similar nature was begun on the La Grange dam in 1907, but was abandoned.

From the standpoint of drainage and overflow these dams are objectionable and various organizations interested in the reclamation of the bottom lands have attempted many times to secure their removal. The Sanitary District of Chicago has several times attempted to remove the state dams at Henry and Copperas Creek. In fact, Section 23 of the Act providing for the organization of sanitary districts and for the removal of obstacles in Desplaines and Illinois rivers, states that "the district — — — shall remove the dams at Henry and Copperas creeks in the Illinois River before any water shall be turned into said channel — — —". The Supreme Court has held that the dams could not be removed until an equivalent navigable depth is available without the aid of the dams. In its 1914 Report, the Rivers and Lakes Commission recommended that the Sanitary District of Chicago remove the two state dams and the Federal Government the La Grange and Kampsville dams, subject to the provision that the river be dredged to insure a minimum depth of seven feet.

It is the opinion of the State Division of Waterways that the removal of these dams would make the navigation of the river impossible during periods of low water, if the present flow of the Sanitary District's canal from Lake Michigan should be curtailed.

At one time all of the bottom land in the lower valley was subject to overflow. The soil is very fertile and the occasional crops which were saved from the floods were so abundant that the incentive to protect the land from overflow was great. The result has been the reclamation of most of the bottom land.

Up to the present time, 322,260 acres have been reclaimed through the organization of 68 districts, of which 45 are located in the former flood plain of the river. There remain some 115,000 acres still subject to overflow. All of this area is below Ottawa.

The southeastern half of Kendall County drains into the Illinois through Aux Sable Creek and its numerous tributaries. There are no organized districts in this area and no need for them, as the natural drainage is good.

All of Grundy County is in the Illinois watershed, and most of it is a broad low plain centering around Morris. The river here has no well-marked banks such as are found further downstream.

In 1896, about 4,500 acres in Felix Township, Grundy County, was organized into the Claypool Drainage and Levee District. The drainage afforded the lands was inadequate due to the large area, outside the district, which drained through it. In 1916, this outside land was annexed making the total area 13,600 acres. War conditions delayed the carrying out of the new plans and the work is not yet completed. The plans are comprehensive and will give thorough drainage to all the lands at an average cost of about \$19 an

TABLE 10.—*Drainage data for the Kankakee River watershed—continued*

Refer- ence No.	Name of district	County	Area
			<i>Acres</i>
52	Union No. 2, Momence and Ganeer.....	Kankakee	2,320
53	Payne-Melby.....	Kankakee	1,050
54	Snake Creek.....	Kankakee	2,300
55	Spring Creek.....	Kankakee	7,040
56	North Wichert.....	Kankakee	1,400
57	Claussen Park.....	Kankakee	3,200
58	Little Beaver Special.....	Kankakee-Iroquois	13,920
59	Hopkins.....	Kankakee	12,320
60	Beaver No. 3.....	Iroquois	5,400
61	Big Beaver Drainage and Levee.....	Iroquois	9,120
62	Beaver No. 1.....	Iroquois	4,640
63	Beaver No. 2.....	Iroquois	4,790
64	Blackson.....	Iroquois	5,020
65	Martinton No 2.....	Iroquois	13,820
66	Middleport No. 1.....	Iroquois	7,880
67	Iroquois No. 1.....	Iroquois	2,460
68	Union No. 1, Martinton and Iroquois.....	Iroquois	6,320
69	Martinton No. 3.....	Iroquois	19,820
70	Papineau No. 3.....	Iroquois	3,380
71	Union No. 1, Papineau and Martinton.....	Iroquois	4,400
72	Martinton No. 4.....	Iroquois	3,040
73	Ashkum No. 1.....	Iroquois	1,120
74	Union No. 2, Danforth and Ashkum.....	Iroquois	17,340
75	Ashkum Mutual No 1.....	Iroquois	1,580
76	Milks Grove Special.....	Iroquois	9,200
77	Union No. 1, Ashkum and Danforth.....	Iroquois	20,880
78	Lahogue.....	Iroquois	13,160
79	Danforth No 3.....	Iroquois	9,910
80	Onarga, Douglas, and Danforth Special No 1.	Iroquois	15,680
81	Union No. 1, Onarga and Ridgeland.....	Iroquois	3,800
82	Union No. 2, Onarga and Ridgeland.....	Iroquois	810
83	Onarga No. 3.....	Iroquois	610
84	Onarga No. 2.....	Iroquois	1,760
85	Union No. 1, Iroquois and Crescent.....	Iroquois	5,140
86	Crescent No. 2.....	Iroquois	1,640
87	Crescent No. 1.....	Iroquois	5,400
88	Union No. 2, Crescent and Iroquois.....	Iroquois	2,440
89	Eastburn No. 2.....	Iroquois	1,370
90	North Sheldon and South Concord.....	Iroquois	5,460
91	Sheldon No. 1.....	Iroquois	760
92	Sheldon Mutual.....	Iroquois	190
93	Possum Trot No. 1.....	Iroquois	11,040
94	Eastburn No. 1.....	Iroquois	3,480
95	Eastburn No. 3.....	Iroquois	1,300
96	Belmont No. 1.....	Iroquois	700
97	Ash Grove No. 1.....	Iroquois	6,620
98	Onarga No 4.....	Iroquois	2,590
99	Onarga No. 5.....	Iroquois	1,300
100	Artesia Mutual No. 1.....	Iroquois	900
101	Artesia Mutual No. 2.....	Iroquois	260
102	Union No. 3, Artesia and Ridgeland.....	Iroquois	4,720
103	Union No. 1, Artesia and Ridgeland.....	Iroquois	800
104	Union No. 2, Artesia and Ridgeland.....	Iroquois	800
105	Harmony.....	Ford	920

TABLE 10.—*Drainage data for the Kankakee River watershed—concluded*

Refer- ence No.	Name of district	County	Area
			<i>Acres</i>
106	Union No. 1, Lynian and Wall.....	Ford	5,640
107	Artesia No. 4	Iroquois	6,820
108	Pond Lily.....	Iroquois	9,350
109	Mud Creek.....	Iroquois	480
110	Whiskey Creek.....	Iroquois	6,240
111	Fountain Creek No. 1.....	Iroquois-Vermilion	5,500
112	Union No. 1, Fountain Creek and Pidgeon Grove	Iroquois	1,120
113	Special Mutual.....	Ford	1,440
114	Rankin.....	Vermilion	960
115	Reilly.....	Vermilion	900
116	Union No. 1, Butler and Fountain Creek.....	Vermilion-Iroquois	2,720
	Total.....		442,950

Districts being organized

117	Black Walnut Creek.....	Will-Kankakee	5,740
118	(Not named)	Vermilion-Ford	1,620
	Total.....		7,360

Upland areas needing drainage

119	Area in old Canavan District.....	Kankakee	3,400
120	Southeast corner of Rockwell Township.....	Kankakee	1,000
121	Custer and Reed townships.....	Kankakee	3,680
122	Salina and Limestone townships.....	Kankakee	8,100
123	Area in North Limestone District.....	Kankakee	2,370
124	Gar Creek District extension.....	Kankakee	6,000
125	Area along Coon Creek.....	Iroquois	7,080
126	Area west of Fountain Creek District.....	Iroquois-Vermilion	11,680
127	Area surrounding Union No. 1, Butler and Fountain Grove	Vermilion-Iroquois	18,000
	Total.....		61,310

Momence the valley is entirely different. Although the country here is flat also, there are no swamps of any magnitude, and the banks of the river are high enough to prevent overflow, except in extreme floods.

Because of the large amount of Indiana swamp land involved, the State of Indiana has given some assistance in remedying the situation. In 1889 its legislature made an appropriation of \$40,000, and in 1891 an additional sum of \$25,000 was given. With this money the channel of the river at Momence was widened to 300 feet and was deepened 2½ feet for a distance of 8,650 feet, the work being completed in 1893. Since then the drainage

TABLE 13.—*Drainage data for the Illinois River watershed—Concluded*

Refer- ence No.	Name of district	County	Area
			<i>Acres</i>
88	Along Illinois River, (northeast of Peoria).....	Tazewell	2,200
89	Along Kickapoo Creek.....	Peoria	2,500
90	Along Illinois River, (south of Peoria).....	Peoria	3,300
91	Along Illinois River, (north of Pekin).....	Tazewell	1,300
92	Along Illinois River, (south of Pekin and LaMarsh)	Peoria	1,600
93	Along Illinois River, (north of Bluff City).....	Fulton	3,000
94	Along Illinois River, Mason County.....	Mason	14,100
95	Along Illinois River, (north of Beardstown).....	Cass	13,000
96	Along Illinois River, (west of Meredosia Lake).....	Cass-Morgan	4,200
97	Along Illinois River (between Meredosia and Naples)	Morgan-Scott	3,500
98	Along Illinois River, (south of Nutwood).....	Jersey	6,000
99	Between Illinois and Mississippi Rivers.....	Calhoun	25,000
	Total.....		115,210

Upland areas needing drainage

100	Area east of Morris.....	Grundy	4,500
101	Northeast of Marseilles.....	La Salle	1,000
102	South of Marseilles.....	La Salle	4,400
103	South of Broadmoor.....	Marshall	2,400
104	South of Belle Plain.....	Woodford-Marshall	4,500
105	West of Minonk.....	Woodford-Marshall	6,500
	Total.....		23,300

About three miles south of Morris, the Dingman Drainage District has given better drainage to 2,200 acres. Only 80 acres of this was useless, the rest having some drainage through private work. The district connected up this private work and provided adequate outlets through its four miles of ditches and one mile of large tile drain. The organization was effected in 1914 and the construction work completed the following year. The commissioners give the former value of the land as \$200 an acre, and the present value as \$300.

About 1,500 acres to the northeast of the Dingman District is now being formed into the Southard District; and two miles to the east, the Winterbottom District is in process of organization. This tract is composed of 3,200 acres and abuts the Claypool District on the northwest.

This is the extent of the organized drainage which has been and is being done in Grundy County. There is considerable opportunity for more drainage in this area. The land between Kankakee and Illinois rivers is all in need of better drainage, and some 4,500 acres of the wettest land is shown on the map. On the south side of the river, the land is low for a distance

of about five miles on each side of Morris, and is subject to occasional overflow. However, from the information obtained, it is a question as to whether the damage to crops warrants the construction of levees. The overflow periods in this part of the valley are of much shorter duration than those in the lower valley.

About three townships along the western side of Kankakee County drain into the Illinois. In the northern part of this area, in Essex Township, is a tract of wet land containing 9,300 acres which is now being organized into the Granary Creek Drainage District.

The northeast quarter of Livingston County is in the Illinois watershed. The topography is flat and the soil is a brown silt loam, spotted with areas of black clay loam. Much of the area is underlain with a tight clay subsoil, and needs artificial drainage. However, very little has been done and only one small district of 800 acres has been constructed. This is the Odell and Nevada District, northeast of Odell. A new district is in the petition stage in Union Township. Here 4,490 acres along Brewsters' Sluice are proposed for the Loretto District. This portion of the county is a fertile field for drainage development and without doubt many districts will eventually cover this area.

In La Salle County, east of Ottawa, no districts have been formed. A large amount of private tilling has been done and the area is well taken care of in this respect, except for a tract of some 4,400 acres located about ten miles south of Marseilles at the headwaters of the several small streams which drain this territory. The land is now raising good crops, but better drainage would be profitable. A second area of about 1,000 acres which would be improved by drainage is situated about five miles northeast of Marseilles.

The northern portion of La Salle County is intersected with many small streams which provide outlets for private drainage, a large amount of which has been done. Along the divide between the Little Vermilion River and Indian Creek four drainage districts have been formed. These are Union No. 1 of Wallace and Waltham, 7,000 acres; Ophir No. 1, 5,240 acres; Ophir No. 2, 1,460 acres; and Meriden No. 1, 2,560 acres. The boundaries of the first mentioned district are only approximate. All of these were organized under the Farm Drainage Act, and some of the township records could not be found.

In the southwestern corner of La Salle County the Lostant District is being promoted. The proposed boundaries include 4,400 acres.

Below Ottawa the Illinois River bottoms are subject to overflow. The river winds through the flood plain which averages about one mile in width as far down as the great bend. Here the flood plain broadens to a width of about two miles and is all on the west side of the river as far south as the Putnam-Marshall county line. This stretch of bottoms consists of approximately 21,500 acres of overflow land.

The water of the Chicago Drainage Canal has damaged thousands of acres which were formerly under cultivation. Mr. L. E. Cooley, in his 1914 report on the "Physical Relations and the Removal of the Navigation Dams," gives the following data concerning the damage claims against the Sanitary District which were under adjudication as of December 31, 1912:

<i>Location</i>	<i>Number</i>	<i>Amount</i>
La Salle County	32	\$ 660,500
Bureau County	18	354,100
Putnam County	38	515,500
Marshall County	36	601,300
Woodford County	8	104,900
Peoria County	14	149,500
Tazewell County	13	411,000
Fulton County	9	112,500
Havana to La Grange	110	1,151,680
La Grange to mouth of river	6	479,000
Total	284	\$4,539,980

The additional claims preferred but not entered of suit at that date will raise the above total to about \$8,000,000. At that time only \$126,823 had been paid in damage claims.

A considerable amount of resentment against the Sanitary District was expressed by various individuals who were consulted during this investigation of drainage conditions.

Only one drainage district has been organized in Bureau County within the Illinois watershed. This is the Union District No. 1 of Wyand and Concord townships, locally known as the Pond Creek District. It contains 1,280 acres between the Rock Island Railroad and the Illinois and Mississippi Canal, just west of Wyand.

Organized drainage is little needed in this part of Bureau County. The only drainage problem is in the Illinois River bottoms. There is some talk of organizing a district at the mouth of Bureau Creek, but no definite steps have been taken.

South of Hennepin a pocket of bottom land on the east of the river has been reclaimed through the organization of the Hennepin Levee and Drainage District. There are 2,610 acres in this tract. The district was organized in 1909 and completed its five and one-half miles of levee and seven miles of ditches in 1914. The land-owners are satisfied with the results of the undertaking, though the district was overflowed in 1914 and 1916. The Commissioners blame their troubles upon the Sanitary District. The land has increased from \$15 an acre in 1909 to \$100 an acre in 1919.

About three miles below the above district the river crosses to the west side of the flood plain and leaves an area about one mile wide and six miles long on the east side which is a feasible levee project. This tract of 4,200

acres, is about equally divided between Putnam and Marshall counties. Sandy Creek, which drains a large upland area, flows through the center of the area and enters the Illinois opposite Henry. This fact may make it necessary to organize two districts here instead of one. Within this area are two lakes, namely, Saw Mill and Bilsbach. It is a question as to whether the former lake could be drained; but, if not, it could be made into a valuable fish and bird preserve, as well as a reservoir for the rain water during flood periods.

Back from the river in Putnam County, the land is more or less rolling and possesses good natural drainage. Across the river from Lacon, the Sparland District has almost completed its organization, and will include 1,570 acres within its boundaries. To the north along Crow Creek, are about 1,300 acres which, while not in the bottoms, are overflowed by the waters of the creek. There is some talk of forming a district here for improving the channel. To the south of the Sparland District is a small tract of 850 acres of bottom land, which might be reclaimed. This area would probably have been included in the Sparland District had it not been for the embankment of the highway between Lacon and Sparland which serves as a levee on the south.

In the northwest corner of Marshall County a wet area is shown on the map. This is the area around Saratoga Lake which it is proposed to drain.

The topography of the upland prairies on both sides of the river is rolling to broken, and the need of artificial drainage is small.

South of Lacon, on the east side of the river, the bottoms are a mile or more in width, and for a distance of about five miles nothing has been done to reclaim them. There are about 2,460 acres in this tract.

Directly to the south, the Crow Creek Drainage District was organized in 1912 and completed in 1914. It extends from the river up Crow Creek for about three miles, and includes 990 acres. The creek was dredged to provide a better outlet for the tile drains. The value of the land has increased from \$40 an acre to about \$150, and the landowners are satisfied with the results of the project. No levees have been built and the district is subject to the backwater from the river. About 1,000 acres up the creek might be annexed.

The sentiment for drainage is not very favorable in Marshall County. The bottom land for the most part is owned by wealthy people, who do not need the income from the land, and who prefer to use it for hunting purposes.

In the northwest corner of Woodford County is located the Partridge Drainage and Levee District, which contains 5,500 acres. It was organized in 1906, but is not yet completed, due to lack of funds. The plans call for seven miles of levee and six miles of ditches. Thus far the district is practically a failure. The present value of the land is only about \$25 an acre.

The Rome View Levee and Drainage District, 5,000 acres, includes all the bottom land remaining on the east side. It was organized in 1915, but has delayed construction due to high prices. The plans are to construct eight miles of levee and eight miles of ditches. The commissioners state that the area to the north in the Partridge District should be included in their district, since the former district has been practically abandoned, so far as constructive action is concerned. Drainage sentiment in the Rome View District is very favorable and without doubt it will be completed successfully.

Below Partridge Creek the valley narrows and there is no overflow for about four miles. From this point to Peoria there is a strip of flooded land about one mile in width. In the middle of this strip, 330 acres have been incorporated in the Ten Mile Drainage and Levee District which was organized in 1917 in Tazewell County. The district is leveed on three sides and has three miles of ditches and three miles of large tile. The undertaking has not been a success according to the commissioners. About one-half the land is not useful and the area is subject to overflow, the last inundation occurring in 1919. The commissioners lay their troubles largely to the waters of the Sanitary District, and feel rather bitter toward that organization.

The overflowed area to the north of the above district contains about 3,000 acres and that to the south approximately 2,200 acres. Both of these are feasible drainage projects.

In the northeast corner of Peoria County is a small pocket of overflow land containing about 1,200 acres. Whether or not this area can be profitably reclaimed is a question which will require careful engineering study.

Several miles south of Chillicothe the Halleck and Medina District is located. It includes 2,800 acres, and is about two miles from the river. It is giving satisfaction.

In the northeast part of Woodford County are two wet areas which would be greatly benefited by the formation of districts. These areas are numbered 104 and 105 on the map. The former contains about 4,500 acres and the latter 6,500 acres.

In the pocket formed by the railroad embankment at East Peoria, the East Peoria Drainage and Levee District was organized in 1910 and completed the following year. One and three-quarters miles of levee successfully protect the area from overflow and three miles of ditches convey the rain, hill, and seepage water to the pumps. The district is composed of 720 acres and the land is valued at \$700 an acre. Here again the Sanitary District was mentioned, and though this district has never been overflowed, the commissioners stated that the high levees required to protect the bottom land, on account of the increased flow, is holding back the reclamation of adjoining areas.

On the east edge of East Peoria the Urbandale Levee and Drainage

District, containing only 100 acres, was organized for protecting the land from the overflow of Farm Creek.

West of Peoria is another small district of 300 acres. It is the Horse-shoe Bottoms Mutual District.

There is some overflow along Kickapoo Creek, extending from Peoria as far north as Jubilee. It is only about one-quarter of a mile wide and contains in all about 2,500 acres.

Between Peoria and Pekin there is overflow on both sides of the river. The area on the west is shown on the map as number 90. About one-half mile south of the north end of this area an industrial canal leads from the river to the plant of the Keystone Steel and Wire Company. Since the map was prepared, information has been obtained that the area south of the canal is being organized into the Tuscarora Drainage and Levee District. It is also quite likely that the area north of the canal will soon be reclaimed for industrial purposes.

On the east of the river, the overflowed area is quite narrow and contains only about 1,300 acres. It is doubtful if it is practicable to reclaim this area.

Opposite Pekin, 2,300 acres of bottom land is embraced in the Pekin and La Marsh Levee and Drainage District, which was organized in 1889, and finally completed in 1902. This has been a very successful district, though the levee has been broken twice and the district flooded. The commissioners attribute these breaks "to the surplus water turned in by the Chicago Sanitary District when the river is at its highest stage." The commissioners gave the value of the land at \$175 an acre, which according to others consulted is a very low valuation. Adjoining this district on the south is a tract of some 1,600 acres which might be reclaimed though it would be rather expensive on account of the comparatively long levee which would be necessary.

The Rocky Ford District is situated across the river in Tazewell County. This is a private district of 1,000 acres belonging to an estate. Four and one-half miles of levee and two and one-half miles of ditches have been constructed.

Below this point the valley widens to about four miles and all the bottom land is within districts. First comes the Spring Lake Drainage and Levee District, which covers 12,100 acres. It was organized in 1903 and completed in 1910. The soil is extremely fertile and recent sales brought \$250 an acre. The pumping station is at the lower end, and the land has just enough slope to give good drainage through 35 miles of ditches. The levee is 16 miles in length, and being convex in shape is not subjected to wave action. Within the district there is a long narrow and shallow body of water known as Spring Lake, which covers about 800 acres. It is about seven miles long and one-eighth to one-quarter of a mile in width, and lies

close to the bluff. This lake is surrounded by a small levee which was built to prevent the lake from being drained. The lake was declared a navigable body of water and the property of the State, and the commissioners were required to construct the levee around the lake and an outlet channel to the south end of the district. Here a Marine Railway which cost the district \$50,000 was constructed for lifting boats over the levee. The commissioners state "that there has never been a single act of navigation committed on the lake since this work was finished four years ago (1915) and there had not been any navigation on the lake for more than twenty years prior to that time. The water therein is from one to two feet deep and there isn't anything in the lake or along the lake for which any person would navigate the same. The grain elevators are built on the river proper and the said lake is now, and always has been, no more than a stagnant body of water of no value to anyone." Similar statements were made by several other parties who were in a position to know the conditions. From the above statement it is evident that the commissioners would like to drain Spring Lake and place its 800 acres under cultivation. This is the logical and sensible course to take and permission should be secured through the Legislature to reclaim this area.

Across the river from the Spring Lake District the Banner Special Drainage and Levee District is situated. It was organized in 1912, completed in 1917, and gives complete drainage to 4,000 acres of bottom land. Over seven miles of levee have been constructed and about eight miles of ditches. A pumping plant, electrically operated, has been built at the lower end of the district. There were four lakes within this area which were filled with water the year round to a depth of three or four feet. These have been drained and their beds comprise the most productive land in the district. In 1912 the land was worth \$3.50 an acre. The present value of the land, where cleared, tiled and in cultivation is \$225 an acre, subject to the first assessment of \$47.75 an acre. It is rapidly rising in value. Copperas Creek, which was straightened at its lower end, forms the southern boundary of the district. Copperas Creek dam is located about one mile farther south.

South of Copperas Creek the Wakonda District begins. It is about three miles wide and five miles long, and contains 7,700 acres. This district is in process of construction, and at present none of the land can be cultivated. The plans provide for a pumping plant.

To the south of the Wakonda the East Liverpool Drainage and Levee District is nearing completion. It was organized in 1916 and contains 3,300 acres. It is constructing seven and one-half miles of levee, eight miles of ditches, and about two miles of large tile drains. In 1916 the land was valued at about \$5 an acre, its present value is \$75, and when drained

will be as valuable as that in neighboring completed districts. It will operate a pumping plant.

The Liverpool Drainage and Levee District comes next with 3,300 acres. It was organized in 1916 but is not completed.

Abutting the above area on the south is the Thompson Lake Drainage and Levee District. The owners of the land had considerable difficulty in organizing due to the fact that a large part of the area was covered by Thompson Lake, a body of water about six miles long and from one-half to three-fourths of a mile in width, and because the land adjoining could not be reclaimed without draining the lake. The question arose as to the ownership of the lake. The State authorities held that the lake was a navigable body of water and therefore the property of the State. The question was carried to the Supreme Court which rendered a decision in favor of the landowners. The district was organized and is now under construction. The cost of clearing and draining the 5,400 acres in this area will be about \$80 an acre. A portion of it is now farmed and produces crops almost every year. The formation of the district was made necessary by the increase in the low water stage of the river due to the water from the Sanitary District. The commissioners state that the increase is from four to six feet. The plans provide for complete drainage of the land and include a pumping plant.

A privately constructed levee district known as the Crabtree District joins the Thompson Lake District on the southwest. There are 1,440 acres in this tract.

At the mouth of Spoon River the bottom land has not been reclaimed, and presents a very feasible drainage project. This area is considered in this report as part of the Spoon River watershed and is discussed in Chapter XIV.

On the east side of the river, about four miles north of Havana, the Chautauqua Drainage and Levee District is now under process of construction. It contains 4,120 acres, which will be protected from overflow by 12 miles of levee and drained by 10 miles of ditches. A pumping plant will be used to lift the water from the district during flood periods.

North of the Chautauqua District lies Mud Lake. It has been proposed several times to organize a district for draining the lake, but nothing has been done.

A large area in Mason County and a portion of Tazewell County drain into the Illinois through Quiver Creek, and three districts have been formed in this area.

Along the lower end of the creek the Quiver River District has dredged the channel for about eight miles and provided an adequate outlet for the land above. This district is quite narrow and contains only 2,000 acres. At the upper end of the watershed lies the Mason and Tazewell Special Drain-

age District, which contains 40,760 acres. It was organized in 1885 and has constructed some 50 miles of ditches. It has proved very successful and the average value of the land is about \$250 an acre.

The third one of this group is the Garden Special which was organized in 1883 and completed in 1886. There are 8,800 acres in this tract, which has been overflowed only twice since the construction of the ditches, namely, in 1889 and 1917.

The Havana Drainage District No. 2 is situated about four miles south of Havana. Its three miles of ditches were completed in 1892 and give satisfactory outlets to 3,840 acres. The land is valued at about \$200 an acre and the landowners are satisfied with the result of the project.

In the six miles of river bottom south of Havana five districts have been organized. The first of these is the Lacey Levee and Drainage District which was completed in 1893. Its drainage works consist of four miles of levee and seven miles of ditches. Individual landowners have laid about 100 miles of small tile drains. The district contains 3,000 acres and the commissioners state that it should be enlarged to include lands to the north. It is operating satisfactorily.

South of this is the Langellier, a privately constructed district of 2,100 acres. There are about five miles of levee, one-quarter mile of ditch, and about two miles of large tile. The water inside the district is pumped into the river.

Further to the south is the West Matanzas Drainage and Levee District, containing 2,800 acres, which has just been completed. Only about one-half the area is in cultivation, but it will require only a short time to clear the remainder and get it in condition to farm. Eight and one-half miles of levee and seven miles of ditches have been constructed. The outlet is into Otter Creek.

West of the last two districts the Otter Creek District was formed, but was later dissolved and the area reorganized into two districts, the Kerton Valley and the Seahorn. The former contains 1,740 acres and the latter 2,800 acres. Both are levee districts and the land ranges in value from \$150 to \$330 an acre.

Between Kerton and Wilson Creeks the bottoms are still subject to overflow. There are 3,000 acres, approximately, in this tract which can be reclaimed just as easily and profitably as the areas above and below.

South of Wilson Creek are the Big Lake and Kelly Lake Districts, containing 3,250 and 990 acres, respectively. The former district was completed in 1912, and is proving very successful. It has six miles of levee and three miles of ditches. The interior water is pumped into the river. The land is worth from \$200 to \$250 an acre. Practically all the land is tiled.

The Kelly Lake District was organized in 1916 and has not yet completed its four miles of levee and two miles of main ditch. This is also a

pumping district. There is no reason why this area should not increase in value to the same extent as that to the north of it.

On the east side of the river from about Matanzas to the Sangamon River the bottoms are about two miles wide and none of it has been reclaimed. There are about 14,100 acres in this tract and all of it could be brought under production through organization.

South of the Sangamon there are 13,000 acres subject to overflow. Nearly all of the land is cleared and under cultivation. It is entirely covered with water in the spring and does not dry out sufficiently for planting till about June. Summer floods on the Sangamon or the Illinois cause frequent loss of crops, but the crops which are harvested are so abundant that most of the area is planted each year. There are no swamp lands here though there are some sloughs which are used by duck clubs for hunting purposes.

Part of this area is being organized into the Griggs Chapel District, which is shown on map as area No. 77. Lately the area to the east is being incorporated into the Sangamon Valley District. These prospective districts overlap and probably only one will perfect an organization. There is an unusual amount of bitter feeling between the advocates of each district, and each is trying to prevent the formation of the other district. The result will be a large amount of litigation before either is successfully organized.

East of Beardstown are two organized districts, the Hager Slough Special and the Lost Creek. The former embraces 3,240 acres and is purely a drainage district. Its ditches are of ample size and are in good condition. However, it has no levees and is flooded at high stages of the river. It can be leveed at comparatively small expense since about one mile of levee would close the gap at the river, and the ground on the north is high and would not require a very high or strong levee.

The Lost Creek District as shown on the map contains 2,260 acres. The blue area to the northwest (No. 78) which is listed as the proposed Lost Creek annexation has been annexed, and the construction of a levee along the river is now in progress.

North of Frederick, above Beardstown, a district of that name is being organized. There are only 960 acres in the tract, and the cost of levees, ditches, and pumping plant will be about \$140 an acre. This is the highest price reclamation which has ever been proposed for any district in the State. But, since the land is now worthless, and when reclaimed will be worth \$250 or more an acre, it will prove a good investment. There is not much opposition and the organization will undoubtedly be accomplished.

Across from Beardstown, the Coal Creek District was organized in 1896, completed in 1899, and reconstructed from 1908 to 1912. The size of this tract is 6,800 acres. It now has over ten miles of river levee, about the same length of interior ditches, a diversion ditch along the bluff, and a pumping plant. The district has accomplished its purpose; however, one

of the commissioners advises that the cost of the district work plus the cost of the private work of clearing, tiling, and other improvements amounts to almost as much as the reclaimed lands will sell for.

South of the Coal Creek District lies the Crane Creek District which covers 5,200 acres. About eight miles of levee keep out the river water, and ten miles of ditches carry the interior water to the pumps. It was completed in 1910 and is considered a successful district. The commissioners suggest that Crooked Creek be diverted around the Big Prairie District to the advantage of both districts.

The Big Prairie District on the south of Crooked Creek has given complete satisfaction. It completed its levee, ditches, and pumping plant in 1918. In 1915 the land was worth about \$15 an acre; in 1919 it had increased to \$100; and when improved by tiling will be much more valuable.

South of Beardstown the bottom land on the east of the river is incorporated in the South Beardstown Drainage and Levee District. There are 8,100 acres in this tract, the drainage works for which were completed in 1918. This is a pumping district and it should prove very successful.

East of this area 3,200 acres are combined in the Valley Drainage and Levee District. Its outlet is in Indian Creek at the south end of the district where one and one-half miles of levee keep out the backwater from the river. Eight miles of ditches have been dredged which carry the interior water to the pumping plant. A 24-inch pump driven by an 80-h.p. motor comprises the pumping equipment. Before completion in 1916, at least two-thirds of the area was practically worthless. The land is now valued from \$120 to \$150 an acre.

The Meredosia Drainage and Levee District is south of the last-named districts and is partly in Cass and partly in Morgan County. It is about two miles from the river, and its levee is along the east side of Meredosia Lake. The district contains 4,000 acres and its nine miles of levee and six miles of ditches were constructed in 1905. The pumping equipment consists of a 24-inch centrifugal pump driven by steam power. A 28-inch and a 30-inch pipe in the levee allows the water to flow by gravity from the district at normal stages of the river. The levee broke in 1913 and the land was submerged. It was rebuilt in 1914 and made higher and wider.

To the east along Indian Creek six districts have been organized. First of these is the New Pankey Pond Special, a small district of 1,400 acres which is operating fairly satisfactorily. It is leveed on the Indian Creek side and has a pumping plant for use during flood stages. The Lower Indian Creek District is on the north and overlaps the northeast corner of the Pankey Pond District. It was completed in 1917 and contains 800 acres. It was formed to open up Indian Creek, but did not do a thorough job and has been only partly successful.

Indian Creek Drainage District No. 2 contains 5,520 acres and extends

along Indian Creek to a point above Jacksonville. It was organized in 1917, but on account of litigation work was not started till 1920. This district will provide better outlets for the neighboring districts, but one of the difficulties has been to secure aid from these districts. The majority were for drainage, but as a commissioner expressed it, "our trouble and litigation came from a few large land owners who claim that God made the duck ponds and that it would be sacrilegious to change His work." The objectors were beaten in both the County and the Supreme Court. The attorney for the objectors, who was also a member of the Legislature, then secured the passage of an amendment to Section 58 of the Levee Act, which automatically changed the jurisdiction of the case from the Morgan County Court to that of Cass County. The Cass County owners along the Creek, fearing that they would be flooded by the water from above, petitioned to be annexed to the district, so that the improvement might be carried beyond them. The result of this annexation was that the majority of the acreage of the district was in Cass County and, in accordance with Section 58, the proceedings were transferred to Cass County. However, the district won its fight here, and started construction work in 1920. Section 58 is still in effect, however, and has caused considerable trouble throughout the State.

The Clear Creek Drainage District, 2,700 acres, lies along the creek of that name and has its outlet in Indian Creek. It will be benefited by the work of the Indian Creek District No. 2.

The Mud Creek District is south of the main portion of District No. 2 and contains 5,520 acres. It was organized in 1899, and gave adequate drainage to the lands for a number of years. Now the ditches need cleaning and probably will be improved shortly. The commissioners are planning to join with Indian Creek District No. 2 in constructing a new outlet.

Indian Creek District No. 1 includes 900 acres along the upper end of that stream, and joins on to District No. 2.

North of the City of Jacksonville the Mauvaisterre Drainage and Levee District was completed in 1915. It has reclaimed a narrow strip of land—about one-third of a mile wide—about five miles in length. It is considered successful, though the commissioners state that the improvement should be extended downstream about ten miles to provide a better outlet.

Along Willow Creek, which empties into Meredosia Lake, the Willow Creek Drainage and Levee District is situated. It covers 3,600 acres and has been fairly satisfactory. There are about 500 acres which are not useful. It has two miles of levee and over four miles of ditches, which were cleaned out in 1916. It does not have complete protection from flood waters or relief from heavy rainfalls.

The Coon River Levee and Drainage District was completed in 1902, and contains 4,630 acres along Coon Run. For a time the district was successful, but for the last twelve years it has been overflowed. Its main ditch

is in Coon Run which was leveed by the spoil taken from the ditch. Protection is needed against the Illinois River water.

Between Meredosia Lake and the river is a strip of overflowed area nearly one mile in width and about six miles in length and containing approximately 4,200 acres. To reclaim this area, levees will be needed both along the river and along the west side of the lake, which is a navigable body of water. The cost of this work has so far prevented the reclamation of this area. South of Meredosia is another overflowed area of 3,500 acres. There is some sand here and between this area and the Coon Run District there is a sand ridge. The feasibility of reclaiming this area is doubtful.

The bottom land on the west side of the river is all in districts. A short distance below the Big Prairie District, a small area of 850 acres has been reclaimed privately. The land is owned by Dr. Kerr and the district is named after him. The district to the south (No. 58 on map) is really an extension of Dr. Kerr's district. He and Mr. Crane own the land and the district is listed in Table 13 under their names. The enterprise has been highly successful. They have bought a drag line machine and are constructing four miles of levee in the south area. The land costs about \$20 an acre, and Mr. Crane estimates that by the time the land is leveed, drained, cleared, and ready to cultivate, the total cost will be about \$110 an acre, and will have a market value from \$200 to \$250. The north area has a pumping station and one is planned for the south area.

Directly below the above districts the bottom land is included in the McGee's Creek Drainage and Levee District. There are 11,250 acres in this tract which lie in Brown and Pike counties. The southern part of this district is well drained. The northern part, however, especially north of the Wabash Railroad, contains a considerable amount of low land which, while protected from overflow, is inadequately drained, and is capable of cultivation only in very favorable seasons. This is a very unusual situation, and there is talk of forming a subdistrict for this area and installing another pumping plant. At present probably 1,000 acres are practically idle.

The Valley City Drainage and Levee District is directly south of the McGee's Creek District. It contains 6,000 acres and is in process of construction. This is the last district on the west of the river. From here on the river flows along the Pike and Calhoun County bluffs, leaving a uniform width of about three miles of bottom land on the east side.

The first district is just south of Naples in Scott County. It is the Mauvaisterre Drainage and Levee District, and includes 1,400 acres within its boundaries. Next comes the Scott County Drainage and Levee District with 10,760 acres. It was completed in 1912 and is all under cultivation except about 80 acres near the pumping station which it uses as a reservoir during flood periods. The pumping equipment consists of a 45-inch and a 24-inch pump driven by steam, which with the aid of the reservoir have so

far removed the water satisfactorily. The twelve miles of levee are of ample design and the twelve miles of ditches are in excellent condition. The waters of Plum and Walnut Creeks have been diverted and flow between levees to the river. This channel forms the south boundary line of the district. The landowners are well satisfied with their investment in drainage.

The Big Swan District begins at the diversion channel above mentioned, and ends at Big Sandy Creek. There are 11,740 acres within the district, which has constructed eleven miles of levee and fourteen miles of ditches. All are in excellent condition. The pumping equipment consists of one 45-inch, one 36-inch, and one 24-inch pump electrically driven. All of the land is under cultivation and is very fertile. This is a very successful district and is an excellent example of what can be done with overflowed land.

Next is the Hillview District, which was completed in 1909. It extends from the Big Swan District to the Chicago and Alton Railroad, and embraces 12,320 acres. It has constructed ten miles of levee, twenty-two miles of ditches, and a pumping station. It has five pumps operated by steam—two 24-inch, two 30-inch, and one 60-inch. The 60-inch pump was installed in 1920, but before it was used the foundation settled and the intake pipe sheared off at the casing. The total cost of the district has been about \$45 an acre. The land is well protected and is valued at from \$100 to \$200 an acre.

The Hartwell District extends from the Chicago and Alton Railroad to Apple Creek. Its thirteen miles of levee, eleven miles of ditches, and pumping station were completed in 1915. The entire 8,800 acres in the district are under cultivation.

Apple Creek, which enters the Illinois at this point, drains a large watershed and has a flood plain of probably one-half mile in width for about twenty miles or so upstream. Surveys and plans have been made for improving the crooked channel of this stream, and the Apple Creek District is in process of organization. About 8,520 acres will be affected.

To the south of Apple Creek the Keach Drainage and Levee District has been organized in the Illinois River bottoms. It contains 10,500 acres and was formed in 1904. It has built over eighteen miles of levee and nineteen miles of ditches, and operates a pumping plant. The land is valued at about \$75 an acre. About 1,140 acres within the district are not useful.

The Eldred Drainage and Levee District joins the Keach District on the south, and extends to Macoupin Creek. It was finished in 1916. All of the 9,300 acres are capable of cultivation. The drainage works consist of 20 miles of levee, 20 miles of ditches, and a pumping plant. It has given the desired drainage and protection, and the commissioners place a value of \$200 an acre on the land.

The Spankey Drainage and Levee District was organized in 1917, and completed in 1919. It lies above Macoupin Creek, and between the bluff and

the Eldred District. There are only 860 acres in the tract which is protected from overflow by levees. However, there is no pumping plant and the area suffers from rainfall during high stages of Macoupin Creek which is the outlet of the district.

South of Macoupin Creek the Nutwood Drainage and Levee District has reclaimed 11,300 acres. Macoupin Creek was diverted from the district by a cut-off to the river at Titus. It is all leveed and, with the exception of about 500 acres, is under cultivation. Thirty-two miles of ditches have been constructed with an outlet in Otter Creek. This is the southernmost district in the watershed. From this point to the mouth of the river, no reclamation work has been done. On the east side of the stream there are about 6,000 acres of overflowed land, and on the west about 25,000 acres. Most of the latter area is in the bend of the Mississippi at the mouth of the Illinois. The land is low and swampy, and there is no interest manifested in its reclamation. The principal crop of Calhoun County is fruit, and since the bottom land is not suitable for fruit growing, very little thought has been given to it. Lying as this tract does at the junction of two large rivers, its reclamation may prove difficult. Further study is needed to decide this question.

The present status of the reclamation of the bottom land in the Illinois Valley is shown in the following table:

Location	Districts organized or being organized		Acreage unreclaimed	Per cent unreclaimed
	No.	Acreage		
Above Peoria.....	7	16,720	35,410	84
Between Havana and Peoria.....	11	46,260	4,600	9
Between Beardstown and Havana.....	13	32,640	30,100	48
Between Grafton and Beardstown.....	21	127,790	38,700	23
Total for River.....	52	223,410	108,810	33

From this it is seen that about one-third of the bottom land remains to be reclaimed. Above Peoria only 16 per cent has been protected from overflow, which is probably ascribable to the comparative narrowness of the valley. This part of the valley has suffered more from the discharge of the Chicago Sanitary Canal than has the portion below. A large part of the bottoms was formerly under cultivation. Of the damage claims preferred against the Sanitary District, 50 per cent were from this portion of the Valley.

The stretch between Peoria and Havana has been 91 per cent reclaimed. That which remains is in small strips, and the cost of its protection will be high. The cost of a district which is now being organized adjacent to these areas is estimated at \$134 an acre.

Between Beardstown and Havana, 48 per cent remains subject to overflow, most of which is near the mouth of the Sangamon.

Below Beardstown, 23 per cent is unreclaimed, of which 65 per cent is at the mouth of the river, and presents a more difficult problem than does the land above.

In 1915, the Rivers and Lakes Commission published a report on the Illinois River and its bottom lands, prepared by John W. Alvord and Charles B. Burdick, Consulting Engineers, of Chicago. This report contains information of the greatest importance to landowners who contemplate the protection of their lands by means of levees, and should be studied by them before making definite plans.

Some abstracts from this report are as follows:

"1. At nearly all places upon the river, the flood of 1844 reached a greater height than any flood of record before or since. This flood occurred during the maximum flood upon the Mississippi and the water passed through a river valley entirely unimproved, very likely a veritable jungle. Under all these circumstances, it is questionable if the flow rates in the 1844 flood very much exceeded those in 1904.

"2. It is our conclusion that it is wise to protect the valley lands against the flood occurring upon the average of once in 50 years, namely, a flood about 35 per cent greater in rate than the flood of 1904.

"3. If the 1904 flood should be repeated with levee districts under construction in 1915 completed, the maximum stage would be about 4.5 feet higher at Valley City than in 1904; at Beardstown, 8 feet; at Havana, 7 feet; at Peoria 6.5 feet; and at the Henry Dam, 7 feet.

"4. If a flood 35 per cent greater than that of 1904 should occur after the valley is completely leveed and should enter the Mississippi at the flood level of 1844, the maximum stage at Valley City would be 8 feet higher than in 1904; at Beardstown, 8 feet; at Havana, 7 feet; at Peoria, 6.5 feet; and at the Henry Dam, 7 feet.

"5. In the Illinois Valley, levees protect farm land only. A failure is not likely to produce loss of life, for in flood, levees are very carefully watched, and if a levee is overtopped, the inhabitants are usually prepared to leave some time in advance of the event. The damage from flooding will be nominal except for the loss of a crop. The flooding of a district about once in fifty years would not seem to involve sufficient damage to incur great expense to provide against flooding, but when the ability to readily sell the land is considered, it is probable that a liberal factor of safety in the height of levees is justified. It will readily be seen that where at all possible levees should extend sufficiently above the maximum water level to guard against the danger of over-topping through wave action and wash."

CHAPTER XIII—GREEN RIVER WATERSHED

The Green River watershed drains 970 square miles of territory situated in Lee, Whiteside, Bureau, and Henry counties. A large amount of reclamation work has been done, and with the exception of one large area of wet land in Lee County, the watershed has been well taken care of from the standpoint of drainage districts. Table 14 gives the drainage data for the twenty-three districts which have been formed. No new work is being done at present.

The Inlet Swamp Drainage District, 30,900 acres, is at the extreme upper end of the watershed and abuts upon the Kyte River District in the Rock River watershed. It is an old district, having been organized in 1887. At first it suffered for a good outlet and the land was not satisfactorily drained. A few years ago Green River, which flows thru the district, was dredged and straightened, which provided the much-needed outlet. Twenty miles of levee, 30 miles of open ditches, and some 13 miles of large tile drains have been constructed. Before the river was improved the district was overflowed every year; now the area is well drained and the market value of the land is about \$250 an acre.

South of Amboy is the Maple Grove District which was formed in 1910. Six miles of ditches and nine miles of levees have been built. The land has not been overflowed since the completion of the drainage works and ranges in value from \$100 to \$200 an acre. The owners consider the project a success and drainage sentiment is very favorable.

In the southwest corner of Lee County and north of Green River, Union District No. 1 of Hamilton and Hahnman townships and Hamilton Special District No. 1 are located. The boundaries of these districts as shown on the map are only approximate. Both are overflowed by Green River and considerably damaged. The river will have to be dredged before these districts can be fully reclaimed. The land across the river is not organized and of the 13,500 acres which need attention only about 50 per cent are cultivated and these raised only about one-third of a crop. However, the soil is not very fertile. There are small areas of dune sand and most of the area is sandy, with a tight clay sub-soil.

The Hahnman District No. 1, 8,070 acres, occupies most of the area of Whiteside County which is in the Green River watershed. So far as could be determined this area is successfully drained.

The Union Special District, of Fairfield, Greenville, and Gold townships, 9,000 acres, is protected from overflow by four miles of levees, and is drained by 20 miles of ditches and two miles of large tile. The land has an average market value of about \$125 an acre. This district is operating successfully. Below the C. B. & Q. Railway crossing in Whiteside County the entire Green River valley is contained in drainage districts. Considerable difficulty has

been experienced in keeping the channel from silting up. The soil is loose and sandy and washes easily, and the ditches fill up as does the river. About

TABLE 14.—*Drainage data for the Green River watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Inlet Swamp.....	Lee	30,900
2	Maple Grove.....	Lee	3,260
3	Union No. 1, Hamilton and Hahnaman.....	Lee-Whiteside	9,000
4	Hamilton Special No. 1.....	Lee	2,500
5	Hahnaman No. 1.....	Whiteside	8,070
6	Fairfield No. 1.....	Bureau	600
7	Union Special, Fairfield, Greenville, and Gold....	Bureau	9,800
8	Green River Special.....	Bureau-Whiteside	14,100
9	Manlius No. 5.....	Bureau	1,870
10	Manlius No. 6.....	Bureau	800
11	Manlius No. 4.....	Bureau	1,000
12	Manlius No. 1.....	Bureau	3,160
13	Hickory Creek Special.....	Bureau	3,760
14	Mineral Marsh.....	Bureau-Henry	9,600
15	Green River Special.....	Bureau Henry	32,000
16	Yorktown No. 1.....	Henry	3,000
17	Central Special.....	Henry Whiteside	3,800
18	Union Special.....	Henry-Whiteside	16,400
19	Blue Joint.....	Henry	3,200
20	Big Slough Special.....	Henry Whiteside	18,160
21	Lower Green River Special.....	Henry	3,700
22	Shabbona Special.....	Henry	4,200
23	Mud Creek.....	Henry	6,210
	Total.....		189,090

Districts being organized

	None.....		
--	-----------	--	--

Overflowed areas

24	Southwest corner Lee County.....	Lee	13,500
25	South of Manlius.....	Bureau	1,200
	Total.....		14,700

every ten years an assessment of about \$30 an acre is necessary to clean them out. At the upper end of Bureau County and extending somewhat into Whiteside County is the Green River Special district which lies on both sides of the river and includes 14,100 acres within its boundaries. Just below is the Green River Special of Bureau and Henry counties, organized in 1904, which contains 32,000 acres and extends half way across Henry

County. Fourteen other districts to the north and to the south empty their waters into the latter district. No levees have been constructed but about 35 miles of ditches have been dredged. The district was overflowed in 1912, 1915, 1918, and 1919. The fall in the river is very small and the back water from the Rock River extends upstream even beyond this district. The sentiment is for levees and cleaner ditches. However, the commissioners state that the value of the land is from \$175 to \$225 an acre.

Manlius No. 5 is a small district of 1,870 acres at the upper end of Hickory Creek.

Manlius No. 4, 1,000 acres, and Manlius No. 6, 800 acres, are abutting districts which have their outlet in Hickory Creek. To the north of these districts there is a wet area of some 1,200 acres which needs attention.

Manlius No. 1, 3,160 acres, is north of Hickory Creek and has its outlet in that stream. This district has annexed lands in Gold township to the west. All of the districts in this township have given satisfaction.

The Hickory Creek Special, 3,760 acres, lies along Hickory Creek. It was organized in 1909 and completed in 1913. The drainage works consist of eight miles of ditches and four miles of large tile. It is not subject to overflow and the ditches are ample to dispose of the rain water. It is considered a successful district and the land has risen in value from \$75 to \$250 an acre.

Downstream from the above district is the Mineral Marsh district, 9,600 acres, about one-third of which is in Henry County. Hickory and Coal Creeks flow through this area. Fourteen miles of levee protect the land from overflow. Drainage is accomplished through 21 miles of ditches and 7 miles of large tile. The land is held at \$275 an acre; when the district was organized in 1899 it was bought for \$25 an acre. Naturally the drainage sentiment in this community is good. The Illinois and Mississippi Canal flows through the southern portion of this district.

All of the Hickory Creek watershed with the exception of the wet area above mentioned is in districts which are operating satisfactorily. This water is emptied into Mud Creek where it is augmented by that from two large districts along that stream. It all flows through the Green River Special District into Green River.

Mud Creek District, 6,210 acres, drains the upper end of Mud Creek. No levees are needed, and 12 miles of ditches and one mile of large tile provide adequate drainage. The district was completed in 1909 and the present average value of the land is \$250 an acre. About one-half mile below the outlet of the district, Mud Creek runs under the Illinois and Mississippi Canal. North of the canal the creek has silted up and as a result the land south of the canal is overflowed. This area might be annexed to the Mud Creek District.

Adjoining the Mud Creek District on the northwest is the Shabonna

Special District, 4,200 acres, which was completed in 1913. Its outlet is Mud Creek, thence to Green River. Three miles of ditches and five miles of large tile serve to drain this area. This land was worth \$150 an acre before the district was organized and as a result of the improvement, values increased \$50 an acre.

In the southeast corner of Yorktown township, Henry County, Yorktown District No. 1 was organized in 1882. It was not completed till 1908. The district contains 3,000 acres, and has dredged eight miles of ditches and laid 20 miles of tile. It is just north of Green River and has its outlet in that stream. The present average value of the land is estimated at \$125 an acre.

The Central Special District, 3,800 acres, is a long narrow one, extending from Green River to the watershed line in Whiteside County. It was organized in 1882 and the first ditches were excavated with teams and scrapers. In 1905 its ten miles of ditches were dredged and enlarged. The district has not sufficient drainage or protection. It was partially overflowed in 1918 and 1919, and at many other times previously.

To the west of the Central Special and overlapping it slightly at the upper end is the Union Special of Henry and Whiteside counties. It covers 16,400 acres, was organized in 1878, and completed in 1880. It has its outlet in Green River, the lower mile and a half being in the Green River Special District. It has 32 miles of ditches and 6.5 miles of large tile. With the exception of a small portion at the lower end, it is free from overflow. The commissioners place an average value of \$150 an acre on the land. The owners are satisfied with the results of the undertaking.

The Big Slough Special of Henry and Whiteside counties extends from the Green River on the south to the Rock River on the north and has outlets in both streams. However, since about 85 per cent drains into the Green River it has been included in that watershed. There are 18,160 acres in the district. It is substantially free from overflow and is satisfactorily drained by its 50 miles of ditches. The value of the land is about \$200 an acre.

The Blue Joint District lies between the last two districts described and contains 3,200 acres. The details concerning this district other than its boundaries were not obtained.

The Lower Green River Special begins where the Green River Special of Henry and Bureau Counties ends. This is the newest district in the watershed, having been organized in 1916 and completed in 1920. It is a "shoestring" district, with an average width of less than one mile, and a length of about 7.5 miles. There are 3700 acres in the district of which about 1000 acres are not useful. Six and one-half miles of levee and the same length of ditches give protection from flood waters and relief from rainfall. As a result of protection and drainage, the land has increased from \$75 an acre to \$225.

There is a narrow strip of overflowed land west of the Lower Green

River Special, which is not shown on the map, since it is doubtful whether it is of sufficient size to warrant reclamation.

The drainage sentiment in this watershed has always been good as is evidenced by the large area reclaimed and by the age of most of the districts. The problem now is to provide better protection against overflow for the lands along the river. The river is silting up, due to low velocity and to the sandy character of the soil, thereby impairing the efficiency of the many districts which empty into it. In fact the trouble is largely due to the Rock River, which has rock ledges near its outlet which restrict the flow as far upstream as Sterling and back up the water in the Green River. It is to be noted that the newer districts have built levees. Possibly the older ones might profitably do likewise. However, with the area organized and under the supervision of drainage commissioners, all difficulties will be gradually overcome.

CHAPTER XIV—SPOON RIVER WATERSHED

Approximately 1790 square miles compose the Spoon River watershed, which covers portions of Bureau, Henry, Stark, Marshall, Knox, Peoria, Warren, McDonough, and Fulton counties.

The East Fork of Spoon River rises in the southwestern corner of Bureau County, and the West Fork has its source in Henry County. The two forks join just north of Modena in Stark County to form the main channel of the river, which flows in a southerly direction through Stark County, thence westward through the northwest corner of Peoria County and the east portion of Knox County, thence southerly through Knox and Fulton counties into the Illinois River, opposite Havana. Its principal tributaries are Indian Creek, Walnut Creek, French Creek, Cedar Creek, and Put Creek.

The extreme length of the watershed is 115 miles and the extreme width 54 miles. The topography is generally flat, except near the streams where it varies from rolling to hilly.

The upland soil is a brown silt loam and the bottom soil is a deep brown silt loam. Corn is the principal crop raised in the river bottom and crops are lost through overflow about once in three years.

The portion of Bureau County in this watershed has numerous small creeks which provide adequate outlets for tile drains, and the landowners have been able to drain their lands without the aid of drainage districts.

The natural drainage of Stark County is very good. The land is slightly rolling and there are no large areas of level land. There has been no organized drainage in this county. A large amount of tiling has been done and all the small level areas are now well taken care of. The landowners appreciate the value of drainage and have done all the work on their own initiative. Good outlets exist naturally and no need has been felt for combined drainage. About three years ago an attempt was made to organize a district along Spoon River in the southern portion of the county, but not much progress has been made. The district as proposed is shown in blue on the map. The river here is winding and irregular. The run-off from the rolling ground adjacent causes the river to overflow at times, but evidently the damage is not serious enough to convince all the owners of the advisability of straightening the river. Hence it is rather doubtful whether a district will be organized for this area.

Knox County is also well drained naturally, and no drainage districts have been formed. Some tiling has been done through individual or mutual effort, using the many small streams as outlets. The drainage problem in this county is along the Spoon River, where the bottoms vary from one-half mile to one mile in width. The river has cut its channel far below the level of the uplands, from which there is a high run-off, resulting in frequent

overflows. The channel is so winding that the water is carried away much more slowly than it enters the valley, and hence the bottoms are flooded frequently for periods of several days. Generally the floods occur in the spring, but often they come during the summer and cause loss of crops. For the most part the valley is too narrow to levee, and any improvements must take the form of river straightening to allow the water to run off faster. The older farmers are satisfied to take their chances on getting a

TABLE 15.—*Drainage data for the Spoon River watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
1	Pleasant Valley.....	Fulton	<i>Acres</i> 1,500
<i>Districts being organized</i>			
2	Upper Spoon River, Drainage and Levee.....	Stark	4,240
<i>Overflowed areas</i>			
3	Along Spoon River.....	Peoria-Knox-Fulton	30,200
<i>Upland areas needing drainage</i>			
4	Akron Township.....	Peoria	8,300

crop. The soil is so fertile and the crops so abundant that they are content to lose one crop in three. However, the younger farmers and the men who have bought the bottom land as an investment are anxious to improve conditions.

Fulton County has the only drainage district in the watershed. In 1918, the Pleasant Valley District was organized southeast of Babylon. It is now under construction and will provide drainage for 1500 acres of land. Spoon River is the outlet for the 3.5 miles of ditches of the district.

The Spoon River bottoms are subject to overflow throughout Fulton County. The overflowed width varies considerably. From London Mills to Ellisville it is about one mile wide; from this point to Babylon it averages about three-eighths mile; thence to Seville it widens to about one and one-half miles, below which point, the valley is less than one-quarter mile in

width to Bernadotte; here it widens again and averages one and one-half miles to Duncan Mills, where it joins the Illinois River overflow which is about two and one-half miles wide.

The total area subject to overflow along Spoon River in Peoria, Knox, and Fulton counties is about 30,200 acres. A topographic survey of the Spoon River valley was made in 1910 and 1911 by the State Geological Survey in coöperation with the U. S. Geological Survey. In 1914, maps of this survey showing five-foot contours were published; and in 1916, a report on the reclamation of lands subject to overflow in the Spoon River valley, by Jacob A. Harman, was issued by the State Geological Survey as Bulletin No. 32.

This report considers the valley only as far as London Mills, and gives the area subject to overflow as 24,400 acres, of which only 16,105 acres would be benefited by the proposed plans of reclamation, the remainder being contained in the narrow portions of the valley and in the flood-ways between levees in the wider portions. One of the essential elements of the report was the amount of straightening of the crooked channel that would be profitable. The present length of channel from the mouth of the river to London Mills is 65.3 miles. The straightened channel, as recommended, would be 50 miles, of which 10.3 miles represents new channel. The report states that a channel from 1600 to 3500 feet wide and from 14 to 18 feet deep would be required to carry the maximum flood water within its banks. The cost of such a channel would be so great that it was not considered in the report. The plan which was recommended consisted of the channel shortening mentioned above, and the construction of levees where the area protected by them was of sufficient magnitude to justify the cost of same.

The conclusions given in the report are as follows:

"1. About 3830 acres in Units 1 and 2 can be completely reclaimed at a cost of from \$5 to \$20 per acre less than a number of levee districts along Illinois River now under construction.

"2. Unit No. 4 will have practically complete reclamation without a pumping plant, which may be later added if experience shows its need.

"3. The straightening of the stream throughout the valley will increase the carrying capacity of the channel about 75 per cent, so that most floods will be carried within the banks of the stream, and the duration of the high water will be lessened in all cases. The straightened channel will widen and have a greater carrying capacity from year to year.

"4. The benefits will justify the expense of the proposed works."

Unit No. 1 referred to above contains 2280 acres on the north side of Spoon River in the Illinois River overflow, and extends upstream about 2.75 miles. The improvement consists of straightening the channel, constructing a levee, and dredging a bluff division ditch. The average cost per acre is given as \$23.40 (1916 prices).

Unit No. 2 includes 1550 acres on the opposite side of the river from Unit No. 1, and extends to within about one mile of Duncan Mills. The improvements recommended are the same as for Unit No. 1, and the cost per acre is estimated at \$31.74 (1916 prices). An effort is now being made to organize the Spoon River Drainage and Levee District in this area, and without doubt it will be successful. The information concerning this district was obtained too late to show on the map.

Unit No. 3 begins where No. 2 ends, and includes the entire valley to a point about 1.5 miles south of Bernadotte, and contains 5890 acres. The improvement for this unit consists of channel straightening only. The cost per acre is given as \$10.33 (1916 prices). From the end of Unit No. 3 to just below the mouth of Put Creek, no improvement is recommended.

Unit No. 4 begins at the last-mentioned point and extends to Babylon. There are 2075 acres here which can be reclaimed at an average cost of \$36.63 per acre (1916 prices). Channel improvement, levee construction and a diversion channel are proposed for this unit.

For a mile and one-half above Babylon no improvement is recommended.

Unit No. 5 begins at that point and ends at Ellisville. There are 610 acres in this unit, for which channel correction alone is recommended. The average cost per acre given is \$16.92 (1916 prices).

Unit No. 6 comprises 3700 acres between Ellisville and London Mills. Channel straightening is recommended at an average cost of \$8.70 per acre.

The area above London Mills was not considered in the report. However, channel straightening would be profitable as far north as Stark County, and above London Mills the area is wide enough for about six miles to warrant levees if they should prove necessary.

There can be no question but that the reclamation of the overflowed land along Spoon River would be profitable. There is some sentiment toward improvement, and as land values increase this sentiment will grow and will probably result in reclamation.

The straightening of the river channel should be carried out as a unit, which can be brought about through the organization of an outlet district. The simplification of the drainage laws making the organization of such a district less difficult would undoubtedly assist in this watershed as in others having a similar problem.

CHAPTER XV—CROOKED CREEK WATERSHED

The Crooked Creek watershed covers 1360 square miles in Warren, McDonough, Hancock, Adams, Schuyler, and Brown counties.

On all old maps, the name of the stream which is now known as Crooked Creek, is the "Lamoine River." Since the former name is better known, it has been used in this report.

Crooked Creek rises in the northeast quarter of Hancock County and flows southeasterly to the Illinois River, about five miles below Beardstown. Its principal tributaries are East Fork, Troublesome Creek, Camp Creek, Cedar Creek, and Little Missouri Creek.

The watershed has good natural drainage, and the upland areas have been tile-drained to some extent without the aid of combined drainage. There are no organized drainage districts within the watershed.

Along the streams the topography is quite broken and the flood run-off is high with the result that nearly every stream has some bottom land subject to overflow.

That the creek is very tortuous may be inferred from its name. It is also badly choked with logs, brush, fallen trees, and gravel carried down by the flood waters. There is an old mill dam at Birmingham which is now a complete wreck and should be removed.

TABLE 16.—*Drainage data for the Crooked Creek watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
	None.....		<i>Acres</i>
<i>Districts being organized</i>			
	None.....		
<i>Overflowed areas</i>			
1	Along Crooked Creek and tributaries.....	McDonough-Hancock-Schuyler	25,180
<i>Upland areas needing drainage</i>			
2	Sciota Township.....	McDonough	2,000

The creek is subject to overflow throughout its length, the width of overflow varying from about one-eighth of a mile at the upper end to over a mile throughout most of it. The map shows over 25,000 acres of such land. Along most of the tributaries, the overflowed area averages about one-eighth of a mile in width. If the main stream were straightened, most of the tributary overflow would cease. The situation along Crooked Creek is serious. Near Birmingham the farmers lost four crops in succession, and sustained a partial loss the fifth year. The overflows occur at no certain time of the year, but have happened during all months of the year, and often twice in the same year. The resulting financial loss is heavy.

The people of this community feel that the State should assist them in remedying the flood situation. Senator W. A. Compton of Macomb introduced a resolution in the 1915 session of the Legislature, which was passed, directing the Rivers and Lakes Commission "to investigate and consider the merits of this stream and its environs, and to recommend a series of improvements consistent with a liberal and State-wide investigation of waterways."

The Rivers and Lakes Commission started the field work of their investigation in September, 1915. Their plans were to make a survey from Macomb to the mouth of the creek. They considered the East Fork as the main channel of Crooked Creek, rather than the West Fork, which is taken as the main channel in this report.

The result of their investigation was published in Bulletin No. 17, dated July 1, 1916. Navigation and channel improvements were the chief factors considered in this bulletin, and flood protection and land reclamation were only of secondary interest.

The plans proposed in the bulletin provide for an 8-foot navigable channel from Macomb to Illinois River. This was to be accomplished by dredging and by the construction of seven locks and dams; also the construction of levees, located from 100 to 250 feet back from the present banks of the stream. The cost of this was estimated at \$2,553,000, or \$21,600 per mile. This project would protect 17,000 acres of bottom land. If the total cost was paid by the land benefited, the assessment would be \$150 an acre. The report concludes with the following statement: "In view of the results and data obtained on this survey and investigation and the estimated cost of improvement based thereon, it is not recommended to improve the Lamoine River at present."

There is little doubt that, from the standpoint of navigation, it would not be profitable to improve this stream, but from the standpoint of land reclamation, it would be very profitable to straighten the stream in places and construct levees where necessary. It is to be regretted that the Rivers and Lakes Commission did not consider land reclamation as separate from navigation. However, we do have an estimate of the cost of reclaiming the bottom land in the Spoon River valley just to the north, where the physical

conditions are very similar. There the average cost per acre of reclamation where levees were constructed was estimated at from \$23.40 to \$36.63 (1916 prices), depending upon the size of the several districts. Where river straightening alone was considered the cost per acre varied from \$10.33 to \$16.92 per acre (1916 prices).

Since the overflowed area along Crooked Creek is more uniform in width than along Spoon River, it is doubtful if the construction of levees would prove profitable, and it would require a detailed study of the valley to determine this point; but certainly the straightening of the channel is economically feasible. However, the improvement should be made as a unit as it would do very little good to straighten stretches here and there along the stream without having a sufficient outlet below. To accomplish the reclamation of this valley, organization on a large scale is required—a thing which a group of individuals would have considerable difficulty in effecting. Here, as in other valleys of the State, the assistance of the State in organizing a district and in planning the necessary improvements would meet with coöperation from the landowners. Without some outside encouragement and assistance, it will be some time before any worth-while improvements are made in the Crooked Creek valley.

CHAPTER XVI—SALT CREEK WATERSHED

The Salt Creek watershed contains 1870 square miles lying in McLean, DeWitt, Macon, Logan, Menard, Mason, and Tazewell counties.

Salt Creek has its source in southeastern McLean County, flows southwesterly and very close to the watershed line through McLean and DeWitt counties to a point south of Clinton; and thence in a general westerly direction through DeWitt and Logan, and between Mason and Menard counties to its junction with the Sangamon River. The main tributaries of Salt Creek are North Fork, Lake Fork, Deer Creek, Kickapoo Creek, and Sugar Creek.

Twenty-seven drainage districts with a total area of 118,770 acres have been organized in this watershed. Seven new districts are in various stages of formation and will add 42,730 acres to the above total. The names and areas of districts are given in Table 17. Approximately 20,700 acres of overflowed lands lie along Sugar and Kickapoo creeks. Practically all of the overflow along Salt Creek itself has been taken care of.

Through the organization of the Salt Creek Special District, the Creek has been straightened from its mouth to within a mile of the Logan County line, from which point the old channel is fairly straight for about two miles. This is the second largest district in the watershed and contains 12,400 acres. The Creek was straightened for a distance of about 11 miles at a cost of not quite \$10 per acre. Very little of the old channel was used. It was completed in 1915. The district has been very successful and the new channel overflows only during extreme flood periods. The land has increased from \$50 and \$100 per acre to \$100 and \$400 per acre.

TABLE 17.—*Drainage data for the Salt Creek watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
1	Easterbrook Special No. 1.....	McLean	5,920
2	Prairie Creek.....	McLean	6,810
3	Kickapoo.....	McLean	3,210
4	Fairview (dissolved).....	McLean	1,840
5	Keenan-Nichols Mutual.....	McLean	2,190
6	Brokaw-Brining-Bailey-Linton.....	McLean	3,010
7	Santa Anna No. 2.....	DeWitt	2,780
8	Harmony.....	DeWitt	2,980
9	Union No. 1, Clintonia and Wapella.....	DeWitt	1,880
10	Union No. 2, Clintonia and Wapella.....	DeWitt	1,440
11	Union No. 1, Clintonia.....	DeWitt	1,600
12	Clintonia Special.....	DeWitt	2,020

TABLE 17.—*Drainage data for the Salt Creek watershed—Concluded*

Reference No.	Name of district	County	Area
			<i>Acres</i>
13	Barnett Special.....	DeWitt	5,000
14	Barnett Mutual.....	DeWitt	500
15	Maroa No. 4.....	Macon	1,430
16	Maroa No. 2.....	Macon	3,040
17	Maroa No. 3.....	Macon	2,920
18	Illini Special.....	Macon-Logan	14,160
19	North Branch Lake Fork Special.....	Logan-Macon-DeWitt	9,600
20	Lake Fork Special.....	Logan	9,000
21	Broadwell Special No. 1.....	Logan	2,520
22	Upper Salt Creek.....	Logan	7,740
23	Union No. 1, Chester and East Lincoln.....	Logan	1,760
24	Prairie Creek No. 2.....	Logan	1,620
25	Prairie Creek No. 1.....	Logan-Mason-Tazewell	9,480
26	Mason City No. 1.....	Mason	1,920
27	Salt Creek Special.....	Mason-Menard	12,400
	Total.....		118,770

Districts being organized

28	Bloomington and Normal Sanitary.....	McLean	4,900
29	Sugar Creek.....	McLean	14,840
30	Necessary.....	McLean	3,290
31	Equitable.....	DeWitt	1,300
32	Midland.....	DeWitt	500
33	Deer Creek.....	Logan	7,000
34	Lower Salt Creek.....	Logan	10,900
	Total.....		42,730

Overflowed areas

35	Kickapoo River.....	Logan-McLean	10,100
36	Sugar Creek.....	Logan-McLean-Tazewell	10,600
	Total.....		20,700

Upland areas needing drainage

37	Northeast of Stanford.....	McLean	7,000
----	----------------------------	--------	-------

Mason City District No. 1, 1,920 acres, has its outlet in Salt Creek, south of Mason City.

The Lower Salt Creek District is now being organized. It will reclaim all the bottom land between the Salt Creek Special District and the Upper Salt Creek District. Preliminary plans have been made and the petition

is being circulated. As proposed it contains 10,900 acres and will connect on the east with the Deer Creek District which has its petition about ready to file. The latter district will reclaim 7,000 acres along Deer Creek, and will extend to the east line of Logan County, practically to its source.

The Upper Salt Creek District, which is now letting contracts, contains 7,740 acres, which is the extent of the bottom land in Logan County.

No improvement along Salt Creek has been made in DeWitt County. The Creek here is crooked and has a small amount of overflow at times, but not enough to cause serious inconvenience.

Southeast of Broadwell, 2,520 acres of upland between Salt Creek and Lake Fork are being successfully drained through the organization of the Broadwell Special District No. 1.

Along Lake Fork and Jones Fork is located another "shoe string" district, which was completed in 1908. This is the Lake Fork Special and contains 9,000 acres. The stream has been dredged for about 13 miles, but the improvement does not give protection to all the lands. The district overflows at some time nearly every year, and the bottom land crops were drowned out in 1919.

Abutting the Lake Fork Special on the east is the Illini Special District, which contains 14,160 acres and is the largest district in the watershed. Jones Fork flows through the middle of the area and is the outlet for the system.

The North Branch, Lake Fork Special District drains some 9,600 acres north of the Illini District. Both discharge their waters into the Lake Fork District, and are somewhat responsible for the overflow which occurs there. To the west, the three small adjoining districts in Maroa Township, Macon County, contain a total of 7,390 acres.

North of the City of Clinton, DeWitt County, a compact group of seven upland districts with a total area of 15,420 acres are all organized under the Farm Drainage Act. Some are old districts and their ditches need cleaning.

A petition is being circulated for the organization of a small district of 500 acres surrounding Midland City, DeWitt County.

Around the village of DeWitt, the Equitable District is being promoted. It will contain about 1,300 acres.

At the extreme east end of the watershed in McLean County, the Eastbrook Special District was formed in 1883. Nine miles of ditches and three miles of tile drains constitute the drainage works. There are 5,920 acres in the district, and the landowners are satisfied with the benefits which they receive. The commissioners give the value of the land as from \$300 to \$400 per acre.

Prairie Creek District, 6,810 acres, has been organized along the upper end of the North Fork of Salt Creek, and is operating successfully.

Northwest of Farmer City, Santa Anna No. 2, containing 2,780 acres,

is located. Directly north of this area, a new district of 3,290 acres, to be known as Necessary District, is being organized.

To the west of Farmer City, in Rutledge Township, two small districts have been organized, but are not shown on the map as the boundaries were not obtained.

Along the upper end of Sugar Creek, the Sugar Creek District is in process of organization, and to the north of this area a sanitary district is proposed for the cities of Bloomington and Normal. The former district will comprise 14,840 acres and the latter 4,900 acres.

West of Bloomington, in Allin and Danvers townships, an area of about 7,000 acres needs better drainage according to the Farm Adviser of McLean County.

In the northwest corner of Logan County, and extending into Mason and Tazewell counties, two organized districts are in successful operation. Prairie Creek District No. 1 contains 9,480 acres and Prairie Creek District No. 2, 1,620 acres.

The overflow along Sugar and Kickapoo Creeks averages about one-half mile in width. Overflows are frequent and considerable losses occur yearly. Along Sugar Creek about 10,600 acres and along Kickapoo Creek about 10,100 acres are subject to overflow.

Drainage sentiment in Logan County is especially good, and the land-owners along Sugar and Kickapoo Creeks are talking organization and without doubt districts will be formed along these streams in a comparatively short time.

It is estimated that about 2,000 acres within organized districts can still be classed as unreclaimed land, which amount added to the overflowed land outside of districts and the wet upland, makes a total of 29,700 acres yet to be reclaimed. This represents 16 per cent of the original amount of such lands.

CHAPTER XVII—SANGAMON RIVER WATERSHED

The Sangamon River watershed proper—exclusive of the South Fork and Salt Creek watersheds—contains 2,340 square miles and comprises parts of McLean, Ford, Champaign, Piatt, DeWitt, Macon, Moultrie, Shelby, Christian, Sangamon, Morgan, Logan, Menard, Mason, and Cass counties.

Sangamon River has its source in the southeastern part of McLean County, and flows southeasterly to the center of T. 22 N., R. 8 E., in Champaign County; thence southwesterly through Monticello, Piatt County, to Decatur; thence westerly to a point near Springfield; then northwesterly to its junction with Salt Creek; and thence westerly to its junction with the Illinois about 8 miles north of Beardstown. The drainage data for this watershed are given in Table 18.

The river is very crooked and its bottom land is overflowed as far eastward as Champaign County. The width of the bottoms varies from one-fourth to one mile, and the total area subject to overflow is estimated at 31,500 acres. This is exclusive of the area in organized districts, and those in process of formation. The soil is extremely fertile and crops are attempted every year. Along the upper end of the river, crops are lost only occasionally; but at the lower end, losses are more frequent, and there is considerable sentiment in favor of improving the channel. The river has already been straightened from the mouth of Salt Creek westward about 25 miles to the edge of the Illinois River bottoms. This has been done by three districts, namely, the Sangamon River Special, the Farmers, and the Mason and Cass River districts.

In 1891, the Mason and Menard Special District was organized, embracing about 6,000 acres of bottom land from the mouth of Salt Creek westward for seven miles. The district constructed 11 miles of ditches using Crane Creek as its outlet. According to one of the commissioners the district has been overflowed four times in the past 20 years. The ditches of this district have silted up rapidly because of the materials brought down from the hills, and have had to be cleaned out about once every eight years. The commissioners were building a dredge to clean the ditches at the time this section was visited.

Across the river in Menard County, the Oakford Special District, 2,200 acres, was organized in 1890, and constructed four miles of ditches emptying into Tar River. Neither of these districts made any improvement in the river channel.

In 1903, the Sangamon River Special District was organized for the purpose of straightening the river. This district extends from near the mouth of Salt Creek to the west line of sections 7 and 18, T. 19 N., R. 8 W., and contains 17,280 acres. Both the Mason and Menard Special and the

TABLE 18.—*Drainage data for the Sangamon River watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Sangamon.....	McLean	3,760
2	Sangamon and Drummer.....	Ford-Champaign	7,720
3	Hillsbury Slough Special.....	Champaign-Ford	5,960
4	Wild Cat Special (including East Bend Mutual)....	Champaign-Ford	10,400
5	Big Slough Special.....	Champaign-Ford	16,200
6	Lotus Special.....	Champaign-McLean-Piatt	32,500
7	Owl Creek.....	Champaign	2,800
8	Blue Ridge Special.....	McLean-Piatt-DeWitt	3,800
9	Newcomb Special.....	Champaign-Piatt	6,400
10	Camp Creek Special.....	Champaign-Piatt	13,600
11	Goose Creek No. 3 (In Deland Special).....	Piatt	1,740
12	Goose Creek No. 4 (In Deland Special).....	Piatt	1,400
13	DeWitt Special (In Deland Special) ^a	DeWitt-Piatt	9,540
14	Friends Creek Special.....	DeWitt-Piatt	17,680
15	Nixon Special.....	DeWitt-Macon	12,480
16	Union No. 1, Creek and Friends Creek.....	DeWitt-Macon	9,180
17	Goose Creek No. 1.....	Piatt	1,000
18	Goose Creek No. 2.....	Piatt	900
19	Wolf Run.....	Piatt	5,500
20	Willow Branch No. 1.....	Piatt-Macon	1,960
21	Union No. 5, Friends Creek and Willow Branch....	Macon-Piatt	1,200
22	Friends Creek No. 4.....	Macon	660
23	Willow Branch No. 3.....	Piatt	960
24	Friends Creek No. 1.....	Macon	1,040
25	Friends Creek No. 7.....	Macon	600
26	Union No. 8, Friends Creek and Maroa.....	Macon	1,360
27	Union No. 9, Friends Creek and Maroa.....	Macon	2,060
28	Friends Creek No. 10.....	Macon	300
29	Friends Creek No. 6.....	Macon	880
30	Friends Creek No. 3.....	Macon	1,530
31	Stephens Creek.....	Macon	7,600
32	Friends Creek No. 2.....	Macon	1,160
33	Whitmore No. 3.....	Macon	440
34	Willow Branch No. 10, By User.....	Piatt	1,940
35	Willow Branch No. 4.....	Piatt	1,640
36	Oakley No. 2.....	Macon	540
37	Quickel Mutual.....	Macon	720
38	Union No. 1, Oakley and Long Creek.....	Macon	2,070
39	Union No. 2, Oakley and Long Creek.....	Macon	1,440
40	Mt. Zion Mutual.....	Macon	560
41	Mt. Zion No. 1.....	Macon	1,650
42	Sauner Chapel (dissolved).....	Macon-Shelby	5,030
43	South Macon No. 1.....	Macon	800
44	Pleasant View No. 3.....	Macon	920
45	Pleasant View Mutual.....	Macon	1,080
46	Pleasant View No. 1.....	Macon	1,520
47	Pleasant View No. 2.....	Macon	1,300
48	Union No. 1, Stonington and Pleasant View.....	Christian-Macon	1,820
49	Stonington No. 2.....	Christian	2,400
50	Union No. 1, Stonington and May.....	Christian	1,660
51	Union No. 1, Stonington and Buckhart.....	Christian	4,500

^aIncludes Goose Creek Special.

TABLE 18.—*Drainage data for the Sangamon River watershed—Continued*

Reference No.	Name of district	County	Area
			<i>Acres</i>
52	Stonington No. 3.....	Christian	2,140
53	Stonington No. 5.....	Christian	1,840
54	Union No. 1, Mosquito and Stonington.....	Christian	2,250
55	Mosquito No. 2.....	Christian	940
56	Union No. 2, Mosquito and Stonington.....	Christian	1,080
57	Mosquito No. 1.....	Christian	1,540
58	Mosquito Mutual No. 1.....	Christian	800
59	Union No. 2, Mosquito and Mt. Auburn.....	Christian	440
60	Mosquito Mutual No. 2.....	Christian	430
61	Mutual, Mosquito and Mt. Auburn.....	Christian	1,200
62	Mosquito Mutual No. 5.....	Christian	710
63	Mosquito Mutual No. 3.....	Christian	900
64	Mosquito Mutual No. 4.....	Christian	1,170
65	Valley Mound.....	Sangamon	640
66	Union No. 1, Lanesville and Illiopolis.....	Sangamon	10,500
67	Central Special.....	Mason	20,000
68	Bulls Eye Special.....	Mason	7,200
69	Hurds Lake.....	Mason	4,080
70	Long Branch Special.....	Mason	7,040
71	Sangamon River Special.....	Cass-Mason-Menard	17,280
72	Mason and Menard Special (Inside Sangamon River Special)	Mason-Menard	.....
73	Oakford Special (Inside Sangamon River Special)	Menard	.....
74	Middle Creek (Richmond Township).....	Cass	750
75	Farmers.....	Cass	9,100
76	Spring Lake and Wilcox Special (Inside Mason and Cass).....	Mason	.....
77	Mason and Cass River.....	Mason-Cass	10,840
78	Clear Lake (Outside of No. 77).....	Cass	800
79	Lynchburg and Sangamon Bottom Drainage and Levee.....	Mason	1,040
	Total.....		320,560

Districts being organized

80	Trenkle Slough Special.....	Piatt-DeWitt-McLean	19,860
81	Deland Special ^b	Piatt	24,460
82	Willow Branch No. 12.....	Piatt	2,960
83	Maroa No. 5.....	Macon	3,200
84	Union No. 10, Maroa and Friends Creek.....	Macon	2,020
85	North Fork Drainage and Levee.....	Sangamon-Christian Macon	10,680
	Total.....		63,180

Overflowed areas

86	Along Sangamon River.....	Champaign-Piatt-Macon	11,000
87	Along Sangamon River.....	Sangamon-Menard	20,500
	Total.....		31,500

^bExcluding area in Goose Creek No. 3 and No. 4 and Dewitt Special.

TABLE 18.—*Drainage data for the Sangamon River watershed—Concluded*

Refer- ence No.	Name of district	County	Area
<i>Upland areas needing drainage</i>			
88	Texas Special (Petition denied).....	DeWitt-Macon	<i>Acres</i> 5,800
89	Union No. 3, Oakley and Long Creek.....	Macon	3,800
90	In Niantic Township.....	Macon	1,280
	Total.....		10,880

Oakford Special districts were included in this project. In straightening the river, very little of the old crooked channel was used.

In 1908, the Farmers District with 9,100 acres was formed for continuing the straightening of the channel for a distance of about five miles downstream. The undertaking has been quite successful, and the land which was formerly worth about \$10 an acre is now valued at \$150.

At the mouth of Middle Creek a district of that name is located, and about 800 of its 1,540 acres are within the boundaries of the Farmers District.

The Lynchburg and Sangamon Bottom Drainage and Levee District was organized for leveeing the stream and its 2,480 acres are protected by 3.5 miles of levee. This is the only district along Sangamon River which operates a pumping plant. About 1,500 acres were later included in the Mason and Cass River District, no objection being raised as to the legality of land being within two districts. The latter district had for its object the straightening of the channel to provide a better outlet for the flood waters brought down in increased volume through the improved channel above.

The Spring Lake and Wilcox Special District dissolved its organization and the land contained in it is included in the Mason and Cass River District.

The Clear Lake Drainage and Levee District is also partly within the Mason and Cass District, and was organized for the construction of a levee. The levee which was built is not high or strong enough and the commissioners are now planning to strengthen it and in all probability will join with the proposed Sangamon Valley District (see page 103) in the construction of a pumping plant.

The straightening of the river channel by the three districts above mentioned has been of great benefit to all the bottom lands. Since completion the channel has almost doubled in width due to the eroding action of the water caused by its increased velocity. However, at the mouth of the river the flood water spreads over the Illinois River bottoms and the channel is rapidly silting up so that the districts at the lower end do not have as free an outlet as formerly. A commissioner of the most westerly district advises

that, while a few years ago they were able to haul coal to the pumping plant in barges, now the channel is so filled with snags, tree trunks, and drift that for the past two years they have been unable to do this. Because of back-water from the Illinois, it will be difficult to prevent this unless frequent dredging is resorted to.

North of Sangamon River in Mason County, 50,000 acres of the upland area are within organized districts. These are simply drainage districts and were all organized under the Farm Drainage Act. All are old and have given and are giving satisfactory drainage, and the land is valued at from \$150 to \$200 an acre. There is no need for further drainage in this county.

Aside from the river districts mentioned, there are no other districts in the Sangamon watershed in Cass and Menard counties. The uplands are rolling and have satisfactory natural drainage. Along the river in Menard County approximately 6,000 acres of land are subject to overflow, most of which can be reclaimed by straightening the channel and using the waste material for the construction of levees as far back from the banks as an excavating machine can deposit it. This will probably not take care of extreme floods and crops may still be lost occasionally, but the benefits derived will be greater than the cost of the improvement. The width of overflow varies from one-quarter to one mile.

In Sangamon County, about 14,500 acres of bottom land are inundated during flood periods. The reclamation problem here is more difficult because of the waterworks dam north of Springfield and the seven large railroad bridges near that place. The landowners in Macon, Sangamon, and Menard counties have held several meetings to make plans for channel improvement, but thus far nothing definite has resulted so far as the entire stretch of river is concerned. But between Roby and a point south of Niantic, the landowners are now organizing the North Fork Outlet District, and the commissioners have been appointed. The plans are to dredge practically a new channel for the stream as was done farther west. There are 10,680 acres within the district, exclusive of the area in the Valley Mound Drainage District, 640 acres, which was organized some years ago. It is believed that the landowners below will continue the improvement at least as far as the mouth of the South Fork.

The upland area between Stonington, Mt. Auburn, and Blue Mound, in Christian and Macon counties, is almost entirely within drainage districts, which drain into the Sangamon either through Buckhart Creek or Mosquito Creek. There are 21 districts in this group with a combined acreage of 30,640 acres, the largest containing 4,500 acres. All were organized under the Farm Drainage Act. Friction has arisen among some of the districts because the upper ones are using as outlets the ditches of the lower ones which are not large enough to carry the additional water. Most of the lower

districts have enlarged or are enlarging their ditches and in some cases the upper districts are sharing the cost.

In the northeast corner of Sangamon County, the Union District No. 1 of Lanesville and Illiopolis, comprising 10,500 acres is under construction. A large amount of private tiling has been done in Sangamon County and the upland areas are in no need of organized drainage.

West of Niantic, a small district covering about two sections is being considered. In fact a preliminary map has been prepared giving proposed boundary, but this area was listed as one needing drainage rather than one in process of organization.

South of Decatur in Macon County, only a small amount of combined drainage has been carried out. Aside from the districts previously mentioned in the extreme southwest corner of the county, there are three others with a combined area of 2,290 acres, and a fourth, which extends into Shelby County, with an area of 5,030. The latter is the old Sauner Chapel District which has dissolved its organization. The smaller districts were organized under the Farm Drainage Act, and the records of their organization were difficult to obtain. There are probably several other small mutual and township districts in this area which are not shown.

From a point below Niantic eastward through Macon, Piatt, and Champaign counties, no districts have been organized for reclaiming the overflowed land in the Sangamon River bottoms. The overflowed portion varies from quarter of a mile to over half a mile in width, and contains approximately 11,000 acres. A dam is being constructed across the river at Decatur to impound water for the use of the city. This will tend to equalize the stream flow below and will retard the flow from above.

In Macon County, east of Decatur, four small districts with a total area of 4,770 acres drain into Sangamon River. These districts have not been entirely successful according to the commissioners though they state that the present value of the land is from \$300 to \$350 an acre. The area is flat upland with little natural drainage and in excessive rainstorms the land is flooded. Such was the case in 1909, 1917, and 1919. Adjoining these areas, there is an area of 3,800 acres which is not organized. A new district has been proposed here, but the opposition has thus far been too strong. Eventually this will be done. In addition to the districts shown on the map, there is Oakley District No. 1, organized in 1893 and containing 1,000 acres, the boundaries of which were not obtained.

Between Cerro Gordo and Monticello, Willow Branch Township Districts No. 4 and No. 10 are located. Number 4 contains 1,640 acres and Number 10, which is a User district, 1,940 acres. The area to the east is now being organized into District No. 12, and includes about 2,960 acres.

Fully 75 per cent of the area north of the river between Decatur and Monticello is either within districts or is now being incorporated within dis-

tracts. There are twenty-four organized districts, totaling 84,970 acres, and four being organized, containing 49,540 new acres, making a grand total of 134,510 acres in an area of about 290 square miles. Only the larger of the districts will be discussed individually.

Six miles northeast of Decatur is the Stephens Creek District, 7,600 acres, which has proved a satisfactory undertaking. An equal area to the northeast is divided among eight small township districts organized under the Farm Drainage Act. Their names and acreage are given in Table 18. To the northwest, Maroa District No. 5, 3,200 acres, and Union District No. 10 of Maroa and Friends Creek, 2,020 acres, have about completed their organization. All of these districts have accomplished their purpose.

Then comes four large districts along the watershed line. These are the Union No. 1, Creek and Friends Creek, 9,180 acres, the Nixon Special, 12,480 acres, the Friends Creek Special, 17,680 acres, and the DeWitt Special, 9,540 acres. All were organized under the Farm Drainage Act; the last three, being special districts, were formed under the jurisdiction of the DeWitt County Court. The value of the land in these districts is given by the commissioners as \$400 an acre, though they state that the projects have been only partially successful. The second and third mentioned are not yet completed. During intensive rainstorms the land is flooded, since it is so level that the water can not flow over the surface, but stands until drained by the tile drains. To the west of these four districts is a tract of about 6,000 acres which needs better drainage. The formation of the Texas Special District was attempted in this area, but the opposition was too strong, and the petition was denied by the court.

The entire area between Monticello and Farmer City is being organized into two large districts. The one to the south, the Deland Special, contains 24,460 acres exclusive of the area in the DeWitt Special and the Goose Creek Districts Nos. 3 and 4, which are included within the boundaries of the new district. The DeWitt Special—the most easterly of the four districts mentioned above—is entirely successful according to its commissioners, but the new district will open up Goose Creek which is the outlet of the former district and hence it has been included. The Goose Creek Special District was organized in 1910 and contains 2,000 acres, but since it was included in the DeWitt Special which was later organized, and is now included in the new district, it is not shown on the map. The principal purpose of the new district is to dredge Goose Creek and thus provide a much needed outlet to the lands both within and without the districts. The two Goose Creek Districts which are included within the Deland Special are too small for comprehensive work, and are not free from overflow due to excessive precipitation. The proposed work will be of considerable benefit to them.

About six miles west of Monticello there is a group of eight districts, the largest of which contains 5,500 acres, with a combined area of 13,220

acres. These are operating satisfactorily with the possible exception of the northern ones which drain into Goose Creek.

The second new district mentioned above is the Trenkle Slough Special which borders on the Deland Special to the south. There are 19,860 acres of new area in this tract, and about 3,000 acres which are in the Blue Ridge Special District. The later was organized in 1915, but no work has been done and it is now to be partly included in the Trenkle Slough District.

To the northeast lies the Lotus Special with 32,500 acres and adjoining it on the southeast the Owl Creek and the Newcomb Special Districts, with 2,800 and 6,400 acres, respectively. The Owl Creek District was organized in 1914 when the land was valued at \$250 an acre. Now the land is priced at about \$400 an acre. However, all of this increase is not the result of drainage.

Along Drummer Creek, south of Gibson City, 7,720 acres are included in the Sangamon and Drummer District, which was completed in 1909. The commissioners advise that the district should be enlarged by annexing some land which drains through the district.

The Sangamon District, 3,760 acres, straddles the river at its source in McLean County. The channel has been dredged and provides a good outlet for the tile drains.

At the extreme upper end of the watershed in Champaign County, three large districts give successful drainage to the level prairie lands. The Hillsbury Slough Special, 5,960 acres, lies along the former slough of that name; the Wild Cat Special, 10,400 acres, which includes the East Bend Mutual drains into the Sangamon River through Wild Cat Slough; and the Big Slough Special, 16,200 acres, completes the drainage of this section of the watershed. The last-named district was organized in 1886, and has constructed 25 miles of open ditch and laid six miles of large tile. The Wild Cat District was formed in 1898, and has nine miles of ditches.

Farther south, between Bondville and Mahomet, 13,600 acres are contained in the Camp Creek Special, which completed its ditches in 1911, and is giving satisfactory drainage to the land.

To sum up the drainage situation in this watershed:

1. Seventy-nine districts have been organized with a combined area of 320,560 acres, which represents 21.4 per cent of the watershed area.
2. Six new districts are being formed, which will add 63,180 acres to the area already organized. This acreage represents 4.2 per cent of the entire watershed area. The Sangamon River watershed ranks fifth among the watersheds of the State as regards new drainage districts in process of organization.
3. Most of the 31,500 acres of overflowed land in the Sangamon River valley can be partially if not completely reclaimed.
4. On the map are shown 10,880 acres of wet uplands. While this

phase of the investigation is incomplete, it is doubtful if there is much more land of this classification.

5. There are yet to be reclaimed, or improved in case of the upland areas, 29,700 acres which represents 16 per cent of the area originally in need of drainage.

The upland areas can be taken care of very easily, and will be as soon as the requisite majority of the landowners realize the economic benefits to be derived from drainage. However, the reclamation of the bottom land is a more difficult problem. The valley is too narrow in most places for levees—except such as can be built from the material excavated from the channel—and hence relief can be secured only by channel improvement. The effect of such improvement is usually to give relief to the upper end of a watershed at the expense of the lower portion; but the Sangamon watershed is long and narrow and lends itself exceptionally well to channel straightening. As explained more fully in Chapter XXX, an improvement of this kind must not be planned piecemeal, and construction should be carried out from the mouth of the stream up. To organize this valley from the mouth of Salt Creek to the west end of the proposed North Fork District is a large undertaking and under present conditions is almost impossible. Two things are needed: (1) a better understanding of the problems involved and of the economic aspects of the case by the landowners, and (2) an easier method of organizing large districts of this kind under the law.

CHAPTER XVIII—BIG VERMILION WATERSHED¹

The Big Vermilion watershed covers 1,250 square miles lying in Livingston, Ford, Champaign, Vermilion, and Iroquois counties.

Vermilion River rises in Ford County and flows southeasterly through Vermilion County and into the State of Indiana where it empties into Wabash River.

More agricultural drainage has been done in this watershed than in any other within the State. Sixty-three districts have been organized, containing a combined area of 317,860 acres, with an average of 255 acres per square mile of watershed area.

This is the highest watershed south of Illinois River and the topography is very flat, except in the southeast corner around Danville. There is little surface drainage, and formerly the rain water stood on the land until it evaporated or found its way slowly through the soil to the shallow natural channels. A large part of the area could not be farmed before the ditches were dug. Now it is considered the best farming land in the State. This has been accomplished by hundreds of miles of open ditches and thousands of miles of tile drains leading to them.

There are no overflowed areas in this watershed such as are found in the watersheds to the south. Along Vermilion River small areas here and there are occasionally overflowed for short periods, but these areas are too small and too scattered to present a real overflow problem. Hence no such areas are listed in this report.

Some of the areas away from the streams suffer through excessive rainstorms, and by comparison with the thoroughly tiled lands within districts may be called wet, yet crops are raised yearly on all the land, and it has a market value of around \$200 an acre, while the drained land is worth from \$350 to \$400 an acre.

The work of all the districts has been very similar, usually the dredging of a main ditch through the lower portion of the district, and in the larger areas the addition of several laterals, which frequently take the form of large tile drains.

The portion of the watershed in Livingston, Ford, and Champaign counties is almost solid with districts, which frequently overlap somewhat. Thirty-six of the sixty-three districts are in these counties, and have a total area of 235,600 acres which represents 74 per cent of the drainage work done in the watershed. One of these, the Big Four District in Ford and Livingston counties, contains 43,320 acres; another, the Beaver Lake District in Champaign County, embraces 32,750 acres; a third, the Spoon River Dis-

¹Flows into Wabash River.

TABLE 19.—*Drainage data for the Vermilion River watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Little Lyman.....	Ford	720
2	Lyman Township.....	Ford-Livingston	10,680
3	Wall Township.....	Ford	10,000
4	Big Four.....	Ford-Livingston	43,320
5	Sugar Creek.....	Ford-Vermilion	6,240
6	Beneficial.....	Vermilion	2,600
7	Hoopeston.....	Vermilion	6,600
8	Bridgman.....	Vermilion	3,190
9	Pleasant Hill.....	Vermilion	1,990
10	Ross No. 2.....	Vermilion	2,300
11	Alvin.....	Vermilion	3,930
12	Green.....	Vermilion	540
13	Union No. 1, Newell and Ross.....	Vermilion	2,570
14	Grape Creek.....	Vermilion	2,950
15	Sinking Hole.....	Vermilion	1,700
16	Ross No. 1.....	Vermilion	1,420
17	Henning.....	Vermilion	890
18	Bean Creek.....	Vermilion	5,400
19	Jamesburg Special.....	Vermilion	4,310
20	Eight Mile.....	Vermilion	5,830
21	Union No. 2, Oakwood and Pilot.....	Vermilion	1,020
22	Oakwood No. 7.....	Vermilion	980
23	Oakwood No. 1.....	Vermilion	1,720
24	Oakwood No. 8.....	Vermilion	930
25	Pleasant View.....	Vermilion	2,520
26	Jordon Special.....	Vermilion	8,390
27	Union No. 1, Vance and Catlin.....	Vermilion	2,120
28	Vance No. 2.....	Vermilion	330
29	Union No. 1, Vance and Sidell.....	Vermilion-Champaign	10,100
30	Homer No. 1.....	Champaign-Vermilion	4,120
31	Union No. 2, Homer and Sidney.....	Champaign	4,120
32	Union No. 3, Homer and Sidney.....	Champaign	1,400
33	Sidney No. 1.....	Champaign	2,320
34	Schinder.....	Champaign	560
35	Wrisk.....	Champaign	1,800
36	South Fork.....	Champaign	3,200
37	Union No. 1, Philo and Sidney.....	Champaign	2,320
38	Union No. 1, Oakwood and Vance.....	Vermilion	740
39	Special No. 1 (Mutual).....	Vermilion-Champaign	600
40	St. Joseph No. 8.....	Champaign	910
41	Bailey Branch.....	Champaign	1,600
42	Union No. 2, St. Joseph and Ogden.....	Champaign	1,720
43	St. Joseph No. 6.....	Champaign	800
44	Silver Creek.....	Champaign	5,290
45	Special No. 3, Urbana and St. Joseph.....	Champaign	6,000
46	St. Joseph No. 4.....	Champaign	4,960
47	Saline Branch.....	Champaign	18,900
48	Stanton Special.....	Champaign	3,980
49	Stanton No. 1.....	Champaign	2,070
50	Union No. 2, Somer and Stanton.....	Champaign	9,330
51	Hensley.....	Champaign	5,450
52	Beaver Lake.....	Champaign	32,750
53	Salt Fork.....	Champaign	7,280

TABLE 19.—*Drainage data for the Vermilion River watershed—Concluded*

Reference No.	Name of district	County	Area
54	West Branch.....	Champaign	Acres 1,880
55	Dillsbury Special.....	Champaign	3,300
56	Flatville Special.....	Champaign	7,260
57	Kerr-Compromise.....	Champaign	1,880
58	Spoon River.....	Champaign	23,460
59	Union No. 1, Ogden and Stanton.....	Champaign	2,150
60	Conkey Branch.....	Champaign-Vermilion	3,260
61	Willow Branch (Inside No. 62).....	Champaign	.....
62	Stony Creek.....	Vermilion-Champaign	7,010
63	Oakwood No. 9.....	Vermilion	150
	Total.....		317,860

Districts being organized

64	Cheneyville.....	Vermilion	1,600
65	Union No. 1, Grant and Ross Townshp.....	Vermilion	1,160
66	Johnson.....	Vermilion	4,700
	Total.....		7,460

Overflowed areas

.....	None.....		
-------	-----------	--	--

Upland areas needing drainage

67	Ford Special (Killed by Supreme Court).....	Ford	7,700
68	Area in Antioch Dist., which failed to organize....	Vermilion	2,250
69	Area south of Pleasant Hill Dist., Ross Township..	Vermilion	2,700
70	Area in Bismark Dist. which failed to organize....	Vermilion	1,540
71	Area along Stony Creek Northeast of Danville....	Vermilion	14,000
72	Addition to Stony Creek district.....	Vermilion-Champaign	6,600
	Total.....		34,790

trict in Champaign County, covers 23,460 acres; and there are two others with a little over 10,000 acres each.

Southeast of Rantoul will be noticed an area of some 25 square miles which is not organized. This is the area which was in the Lower Salt Fork District, whose organization was invalidated by the Supreme Court.

Along the southern edge of the watershed is a row of seven districts, covering a total of 28,110 acres, the largest of which contains 10,100 acres. They provide adequate drainage for the flatter areas south of the Salt Fork.

Six miles north of Danville, a tract of 17,850 acres between the Middle and North Forks of Vermilion River is drained through the ditches of five districts. Along the Illinois-Indiana State line there are five other small districts, and some seven or eight isolated districts are scattered through Vermilion County.

Three districts are being organized in this watershed, all in Vermilion County. The largest of these is known as the Johnson District and proposes to give drainage to 4,700 acres along the Chicago and Eastern Illinois Railroad between Ellis and Reilly stations. East of Cheneyville the second proposed district is situated. It proposes to benefit some 1,600 acres and will probably be called the Cheneyville District. Union No. 1 of Grant and Ross townships is the third new district with 1,160 acres.

In an area such as is covered by this watershed, it is difficult to forecast the drainage development. To the casual observer there is no further need of drainage, and the average landowner will corroborate this fact. However, with past performance in mind, where land worth \$250 an acre has been more completely drained with profit, it is safe to say that there will be much more drainage work done in the future.

Six areas are shown on the map as in need of better drainage. The first of these is around Paxton. Some years ago, an attempt was made to organize the Ford Special District here, but it was not successful, due to a decision of the Supreme Court. Probably the organization of the 7,700 acres in this tract will be more successful later.

Likewise, an unsuccessful attempt was made to combine 2,250 acres in the Antioch District in Vermilion County.

Southeast of Alvin, the area in the Bismark District, which failed to organize, is shown.

The largest of the wet areas is along Stoney Creek, northeast of Danville. The boundaries as shown on the map are only approximate. According to information obtained from an engineer familiar with the situation, Stony Creek should be dredged.

To sum up the present situation in the Vermilion watershed:

1. The 63 districts include 317,860 acres, representing 39.7 per cent of the watershed area. The name and area of each district is given in Table 19.
2. Three districts with a combined area of 7,460 acres which are being formed, represent 0.9 per cent of the watershed.
3. On the map are indicated 34,790 acres of land which needs better drainage.
4. There may be several small organized districts, the locations of which were not obtained.

In conclusion, it may be said that the drainage work done in this watershed has been very successful. For the most part the districts have had no serious difficulties. Of course the ditches have had to be cleaned out occa-

sionally and in a few instances have had to be enlarged. The cost of drainage here has been much less than that in the western and southern parts of the State, where levees and pumping plants are required.

One result of drainage in this watershed is a much smaller low-water flow during the summer months. The cities which depend upon the river for domestic water supply and for the dilution of sewage are adversely affected by extensive farm drainage.

Since the effect of drainage is to lower the level of the ground water, and since the principal source of summer stream flow is the ground water, it naturally follows that the more the drainage the less the summer flow. This is a matter which should be given serious consideration by engineers, and if possible a solution found for the difficulty.

CHAPTER XIX—WABASH RIVER WATERSHED

The Wabash River watershed in Illinois embraces 2,680 square miles of territory lying in Champaign, Vermilion, Edgar, Clark, Crawford, Lawrence, Richland, Edwards, White, and Wabash counties.

Wabash River forms the east boundary line of the State from a point east of Marshall in Clark County to its junction with the Ohio River near Shawneetown.

The principal tributaries are Little Vermilion River, and Brouillett, Sugar, Big, Mill, and Bonpas creeks.

Table 20 gives the drainage data for this watershed. It will be observed that 62 districts with a combined area of 207,520 acres have been formed, and that seven are now in process of organization, which if successful will add 42,750 acres to the total. These together represent 14.7 per cent of the watershed area. The drainage problem here is represented by 48,920 acres of overflowed lands in the river bottoms and along Bonpas Creek. In addition 10,220 acres of wet upland area require attention.

TABLE 20.—*Drainage data for the Wabash River watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Little Vermilion Special	Champaign-Vermilion	17,280
2	Union No. 2, Carroll, Jamaica and Sidell	Vermilion	2,400
3	Union No. 1, Carroll and Jamaica	Vermilion	3,100
4	Jamaica Special	Vermilion	4,650
5	Fayette Special	Vermilion	6,590
6	Butler Branch	Vermilion	2,490
7	Fairview Special	Vermilion	6,060
8	Maple Grove	Vermilion	3,160
9	McKendree	Vermilion	1,320
10	Vermilion Grove	Vermilion	1,600
11	Prairie No. 2	Edgar	8,500
12	Prairie No. 1	Edgar	5,000
13	Ross No. 1	Edgar	1,740
14	Young America No. 2	Edgar	4,520
15	Union No. 1, Shiloh and Edgar	Edgar	2,700
16	Shiloh No. 3	Edgar	6,530
17	Shiloh Special	Edgar	3,920
18	Burnham Special	Edgar	900
19	Buck No. 7	Edgar	1,950
20	Sims Special, Shiloh and Buck	Edgar	3,320
21	Union No. 1, Paris and Edgar	Edgar	2,360
22	Union No. 2, Paris and Buck	Edgar	1,950
23	Hollenbeck Drainage and Levee (private)	Clark	1,500
24	York No. 1 (dissolved)	Clark	3,090
25	York No. 2 (dissolved)	Clark	2,000

TABLE 20.—*Drainage data for the Wabash River watershed—Continued*

Reference No.	Name of district	County	Area
			<i>Acres</i>
26	Mutual.....	Crawford	1,250
27	Mutual.....	Crawford	2,800
28	Tri-pond.....	Crawford	6,105
29	Frog Pond.....	Crawford	4,820
30	La Motte and Montgomery.....	Crawford	2,790
31	Taylor Pond.....	Lawrence-Crawford	7,040
32	Allison No. 1.....	Lawrence	7,350
33	Allison No. 2.....	Lawrence	12,000
34	Russell and Allison Drainage and Levee ^a	Lawrence	6,500
35	Ambraw Drainage and Levee ^b	Lawrence	.....
36	England Pond.....	Lawrence	6,370
37	Big Slough.....	Lawrence-Wabash	3,620
38	Allendale No. 1.....	Wabash	1,040
39	District No. 11.....	Wabash	1,600
40	District No. 4.....	Wabash	1,920
41	District No. 13.....	Wabash	175
42	District No. 7.....	Wabash	3,600
43	District No. 14.....	Wabash	1,000
44	District No. 14.....	Wabash	1,000
44	Bonpas No. 1.....	Edwards-Wabash	3,800
45	District No. 6.....	Wabash	2,770
46	District No. 1.....	Edwards	2,400
47	District No. 8.....	Wabash	1,860
48	District No. 3.....	Wabash	925
49	District No. 2.....	Wabash	3,000
50	District No. 5.....	Wabash	1,390
51	District No. 10.....	Wabash	2,280
52	District No. 16.....	Wabash	900
53	District No. 9.....	Wabash	1,600
54	District No. 1.....	Wabash	1,765
55	District No. 15.....	Wabash	370
56	Fox River No. 1.....	White	1,320
57	Hawthorne Mutual No. 2.....	White	4,260
58	Cat-tail.....	White	800
59	Emma No. 6.....	White	1,560
60	Emma No. 3.....	White	4,710
61	Clark.....	White	2,000
62	Emma No. 7.....	White	1,200
	Total.....	.....	207,520

Districts being organized

63	Paris No. 3.....	Edgar	550
64	Area west of Palestine.....	Edgar	880
65	Raccoon Creek.....	Lawrence	13,200
66	Little Bonpas.....	Lawrence-Wabash	6,400
67	Bonpas No. 2.....	Edwards	1,120
68	Rochester and McCleary Bluffs Levee and Drainage ^c	Wabash	2,000
69	White County Drainage and Levee ^d	White	18,600
	Total.....	.....	42,750

^aSix thousand five hundred acres outside of districts already listed.^bComposed of districts already listed.^cTotal area is 4,500 acres; 2,000 acres of which are not contained in other districts.^dTotal area is 24,000 acres; 18,600 acres of which are not contained in other districts.

TABLE 20.—*Drainage data for the Wabash River watershed—Concluded*

Reference No.	Name of district	County	Area
<i>Overflowed areas</i>			
			<i>Acres</i>
70	Along Wabash River north of Darwin.....	Clark	4,000
71	Along Wabash River south of Darwin.....	Clark	4,000
72	Along Wabash River at York.....	Clark-Crawford	7,000
73	Southeast of Hutsonville.....	Crawford	520
74	Area in Catfish bend on Wabash (T. 1 N., R. 11 W.)	Wabash	800
75	Along Wabash south of Mt. Carmel.....		2,400
76	Along Upper Bonpas River.....	Richland-Edwards- Wabash	7,500
77	Lower Bonpas.....	Edwards-Wabash	8,000
78	Along Wabash in southern part of Wabash County..	Wabash	6,300
79	Along Wabash in southeastern portion of White County.....	White	8,400
	Total.....		48,920
<i>Upland areas needing drainage</i>			
80	Area northwest of Mortimer.....	Edgar	1,300
81	Area southeast of Mortimer.....	Edgar	1,600
82	Area south of Metcalf.....	Edgar	2,200
83	West Edgar district which failed to organize.....	Edgar	1,900
84	Northeast of Paris.....	Edgar	2,500
85	Bullet Pond Area.....	Edgar	720
	Total.....		10,220

The area along the north edge of the watershed has all received organized drainage. Nine districts in this group, all in Vermilion County with the exception of the Little Vermilion Special which is 75 per cent in Champaign County, drain into Little Vermilion River. The nine districts cover 47,040 acres. The largest of these is the Little Vermilion Special, containing 17,280 acres, which is the only one which lies directly in the river valley. Below this district Little Vermilion River overflows for a width of about a quarter of a mile and needs dredging very badly.

Three of the above districts are recently organized and have not yet completed their ditches. The Maple Grove District was organized in 1916, at which time the land was valued at \$150 an acre in spite of the fact that it was overflowed with rain water every wet year. When the 15 miles of ditches are completed, the land will have complete outlets for the tile drains and it is expected that it will then be worth at least \$250 an acre. The second district, the Butler Branch, was organized in 1917, when about two-thirds of its 2,490 acres was considered too wet for the best results, even though the land was then valued at \$250 an acre. The McKendree District was formed in 1920, and has done no construction work as yet.

Most of the land in districts produced fair crops every year before it was drained, and is not to be considered in the same class as the overflowed land in the bottoms of Embarrass, Little Wabash, and similar streams. The fertility of the land is such that the owners feel that they can afford to drain it even though its value without combined drainage is from \$150 to \$250 an acre.

From the present activity in this area it is highly probable that other districts will be formed. It is impossible to indicate just where they will be located since adjacent landowners differ as to the advisability of more drainage. When this area is fully developed, if not before, some attention will have to be given to Little Vermilion to enable its channel to carry the increased run-off.

The drainage in Edgar County is through Brouillett and Sugar Creeks to Wabash River. There are twelve organized districts here with a combined area of 48,650 acres. All are located on the upland prairie, which is similar in topography and soil type to that in Douglas and Champaign counties. The soil is a brown silt loam with patches of black clay loam, a type which is nearly always too wet without artificial drainage. Along the eastern half of the watershed the land is broken with steep slopes, the soil is thin, and a considerable portion is wooded. Here the soil is a yellow-gray silt loam except in the creek bottoms where it is a mixed loam.

A number of these districts were organized in the early 80's and some as late as 1912. So far as could be determined all of them have given satisfaction though a few need cleaning at present. The wettest spots have been taken care of, but since all of the upland prairie contains scattered areas of black clay loam, it is safe to say that other districts will be formed, especially since land values have increased. A small area of 556 acres southwest of Paris is now in the process of formation, and will probably be known as Paris Township District No. 3.

Several areas in Edgar County are shown on the map as in need of drainage, one of which is southeast and one northwest of Mortimer. Another is south of Metcalf and still another northwest of Edgar. The four areas contain about 7,000 acres. An unsuccessful attempt was made several years ago to organize the last mentioned area into the Edgar Drainage District. In 1913, the owners of the land in sections 23, 14, and 15, T. 14 N., R. 11 W., 2d. P. M., tried to form the Hunter District, but the objectors won out in court, and the petition was denied. It is the intention to prepare another petition to include a much larger area to the northwest, about 2,500 acres in all.

Without doubt other areas need drainage as much as those which are shown on the map and listed in the table. The ones shown are those which were specifically pointed out by landowners and others familiar with the locality.

Sugar and Brouillett Creeks appear to offer the only stream problems, and they minor ones. Sugar Creek flows southeasterly from Paris, and receives the drainage of that city as well as that of some of the upland drainage districts. Part of the flow is impounded north of Paris for water supply purposes. Residents claim that before the districts were formed and before the city had reached its present growth, little or no trouble was experienced along this stream; but that in recent years its flood periods are much longer. It is believed that clearing the channel of drift would largely remedy the situation. Several attempts have been made to organize for this purpose, but each time it was sought to include the city of Paris and the upland districts, both of which objected strenuously and the project was dropped. However, the overflow area along this stream will probably not exceed 1,000 acres. The conditions are very similar along Brouillett Creek, and the area affected about 1,200 acres.

South of Paris the topography is much rougher, and the need of artificial drainage very slight. This is true also of that portion of Clark County which is within the Wabash watershed. Mill Creek and Big Creek are the main streams in this county, and flow in district valleys, varying considerably in width, and bordered by rounded bluffs. The valley floors are nearly level and contain fair land, but all is subject to overflow. Normally the flow in these streams is small but a few hours of steady rainfall will put them out of their banks, especially in the spring of the year. The floods are usually of short duration and the streams subside in a few hours. This makes the cultivation of these lands uncertain and not infrequently crops are lost. The streams carry a considerable amount of drift, which sometimes obstructs the channels to such an extent as to change the course of the streams and to destroy good land.

Wabash River borders Clark County south of Marshall, and its valley is from one to three miles in width. Three districts have been formed in this area. At the Aurora bend, a levee one and one-half miles long and about 15 feet high was constructed several years ago by Judge W. T. Hollenbeck to protect some 600 acres of his land from overflow. Incidentally the levee protects some 900 acres of adjoining land, but Judge Hollenbeck has borne all the expense. There are sluice gates in the levee for low water flow from the district, but no pumping plant.

Above this district is a strip of overflowed land about three-quarters of a mile in width, and seven miles long, containing approximately 4,000 acres, which appears to be a feasible drainage project. To the south is an equal area roughly square in shape which could be protected by two miles of levee and very profitably reclaimed.

South of the last mentioned area, the land was organized some 15 or 20 years ago into York Township Districts No. 1 and No. 2. Ditches were dredged and the land successfully drained; but apparently feeling that their

work was done and that there was no longer any reason for existence, these districts were dissolved. The ditches have silted up and the land is becoming wet again, but having no organization, nothing can be done. They will probably re-organize for maintenance work. No levees were ever constructed, and the land is subject to overflow during the greater floods. Surrounding these districts on the east, south, and west is land which should be reclaimed. The entire bottoms below Darwin to the south line of the county would make an excellent levee project. Districts less favorably situated along Illinois River have very profitably invested in levees and pumping plant.

A small district in the southwestern corner of York Township, near Bullet Pond, was started in 1919 to drain some swamp land and to prevent the overflow of a small stream; but the petition was denied by the Court on the grounds that the cost would exceed the benefits.

The Tri-Pond District in Crawford County takes in nearly all the overflow land between Hutsonville and Palestine. It contains 6,105 acres and has constructed eight and one-half miles of ditches and laid three miles of large tile. A levee about four miles long was built along the river in 1873, but it was not properly maintained and has been washed out in a number of places, so that it affords no protection to the district. Some of the land-owners are in doubt as to whether a levee would be of any real value due to seepage of water under it through the gravelly subsoil. Fortunately the floods usually came at a time when little damage is done to the crops. The commissioners of this district place a value of \$100 an acre upon the land.

The Frog Pond District is to the west of the Tri-Pond and uses the latter's ditch as an outlet. It contains 4,820 acres and being farther from the river and on higher ground, is rarely subject to floods from the river, though due to lack of satisfactory outlet in times of high water, the water which is precipitated upon it cannot run off till the flood subsides. The two districts are now co-operating to construct a better outlet and to make certain changes in their ditches and to clean them.

North of the Frog Pond District is an area of about 2,800 acres which is in need of better drainage. It is owned by a few individuals who are planning to construct the necessary ditches through a mutual district.

There is another area of approximately 1,250 acres north of Hutsonville, the owners of which are preparing to organize a mutual district.

The LaMotte and Montgomery District embraces 2,790 acres, which is practically the entire area subject to overflow between Bright Light Ferry and Shaw's Landing. The conditions here are about the same as those in the two districts to the north. None of these districts have pumping plants.

With the exception of a narrow strip in the northeast corner and a small pocket south of Hutsonville, all the overflowed lands along the Wabash in Crawford County which are capable of being reclaimed economically are in drainage districts. There is nothing more to be done here unless it is found

practicable to construct a levee. There is a question as to whether the benefits of such a levee would exceed the cost.

In the northeast corner of Lawrence County, and extending into Crawford County, the Taylor Pond Drainage District is located. It was organized in 1902 and has about 13 miles of ditches. It has two outlets, one near Russellville into the Wabash, and the other into the Otter Pond Drainage District's ditch which empties into the Embarrass. This district is really in both watersheds. Although the district is included in the Russell and Allison Levee District it is not free from floods and was overflowed in 1898, 1902, 1906, 1911, 1913, and 1915. The creation of the district increased land values from about \$20 an acre to about \$90.

Allison Drainage District No. 1 was organized in 1897, and includes the higher land back from the Wabash. It is a long narrow district and has a ten-mile ditch running through it. It is considered to have accomplished its purpose and the land is held at \$100 an acre. It is subject to occasional overflows, however, in spite of the levee of the Russell and Allison Levee District of which it is a part. The land was flooded in 1907, 1913, and 1915. The outlet of this district is in Embarrass River, a few hundred feet above the mouth of that stream. The floods come from both Wabash and Embarrass Rivers, and the district is included in both the Russell and Allison Levee District and the Ambraw Levee District. However, it has been thought best to list it under the Wabash watershed rather than the Embarrass.

Allison Drainage District No. 2 is between District No. 1 and the Wabash River. Its outlet is into the ditch of Allison No. 1.

The Russell and Allison Drainage District was organized in 1882, and contains 31,000 acres. It has a levee along the Wabash from the Lawrence-Crawford County line to within about two miles of the mouth of Embarrass River, a distance of 18 miles. From this point the levee extends northwest for three miles to the higher ground in section 16, T. 3 N., R. 11 W. Within this district, the two Allison districts, the Taylor Pond District and part of the Beaver Pond District have been organized.

There has been much overlapping of districts and frequently unjust assessments have been levied. The landowners blame the drainage laws for this condition. The levee was originally high enough but the flood stages have been increased by drainage above, and at present it does not offer complete protection. The district has spent \$400,000 to date and should spend considerable more to raise the levees and install pumping plants. However, it has unpaid bonds and this increases the difficulty of attempting new work. Nevertheless the commissioners have been ordered by the Lawrence County Court to prepare plans and estimates for pumping plants. One of these is to be located at the end of the Allison ditch No. 1 and the other at the end of the Beaver Pond ditch. To carry out these plans, it is proposed to combine all of the districts under one board of commissioners.

In 1909, the Ambraw Levee District was formed embracing some 13,000 acres in the Otter Pond, Beaver Pond and Allison No. 1 and No. 2 districts. A levee one mile long was built in sections 29 and 30, T. 4 N., R. 11 W., to keep out the flood waters of the Embarrass River. This levee has not entirely succeeded in its purpose, and it is now planned to construct a new one in sections 31 and 32.

Below the mouth of Embarrass River, the Wabash watershed widens out again, and includes the southern one-third of Lawrence County and the southeast corner of Richland County.

The low area at the junction of Embarrass and Wabash rivers is contained in the England Pond Drainage District, whose ditches empty into the Wabash River. There are no levees here and the area is overflowed during high water on both streams. The district has good ditches which quickly carry away the water after the floods subside, and drain the land, and the landowners are fairly well satisfied.

On the southeast, and back from the river, the Big Slough District is located. It was organized in 1907, contains 3,620 acres, and has dredged five and one-half miles of ditches. It has not been entirely successful, since it has no protection from overflow, and was flooded in 1916, 1917, 1918, and 1919. Nevertheless, the land has increased from about \$25 an acre in 1907 to \$175 an acre at the present time, not all of which is due to drainage, however. The commissioners are planning to enlarge the district by annexing small areas on all sides aggregating about 1,000 acres.

To the west, a large district is being promoted along Racoon Creek, which will contain some 13,200 acres, and will include the old Union District of Luken and Dennison townships, which was organized under the Farm Drainage Act. With a few exceptions all the districts south of Clark County have been organized under the Levee Act.

Still farther west, the bottom land along Little Bonpas Creek in Lawrence and Wabash counties, amounting to about 6,400 acres, is being organized into the Little Bonpas District. With these two districts completed, that part of Lawrence County within the Wabash River watershed will be well provided for as regards drainage.

There is no organized drainage in Richland County, and none is contemplated. Some overflowed land along Bonpas Creek should be included in a large outlet district for the entire valley. The amount of such land, as far south as the organized districts in Edwards and Wabash counties, is 7,500 acres.

Wabash County is entirely within this watershed. In all, sixteen districts have been organized, and for the most part they have been entirely successful. The largest district contains 3,600 acres, and the combined area is 26,300 acres.

District No. 1 was organized in 1880, and the value of the land has increased from \$20 an acre to \$200. There is no overflow and all the lands have complete drainage.

District No. 2 adjoins No. 1 on the northwest, and is entirely successful.

District No. 3 was organized in 1882. It was overflowed by the big flood of 1913, but normally it is free from overflow, and has given perfect satisfaction.

District No. 4 is in the northeastern portion of the county, and is high enough to escape overflow and has been largely responsible for the favorable drainage sentiment in that locality.

District No. 5 is not subject to overflow or backwater, and its success is indicated by the increase of land values from \$40 an acre to \$200.

District No. 6 has its outlet in Bonpas Creek, and about 60 per cent of the land lies within the flood plain of that stream. Since it has no levees it is overflowed during periods of high water. This district should be partly included in a large outlet district along Bonpas Creek.

District No. 7 was organized in 1878, and was one of the first to be constructed. All the land within it has been benefited, and it is considered to have accomplished its object, though it is partly overflowed every spring. The present value of the land is about \$125 an acre. Drainage sentiment is good in this community.

District No. 8 was formed in 1889. It is above the flood plain of Bonpas Creek, and has operated satisfactorily.

District No. 9, organized in 1890, is almost entirely within the limit of highwater from Wabash River and is flooded annually. It is included in the proposed Rochester and McCleary Bluffs Levee District and will be protected when that district is constructed. The land is held at about \$80 an acre.

District No. 10 is located along Sugar Creek just east of Maud. It is free from overflow and so far as could be ascertained is giving satisfaction.

District No. 11 is on the upper end of Crawfish Creek which is very crooked. It does not have a satisfactory outlet and was overflowed in 1914, 1917, 1918, and 1919. It should extend farther south. The landowners for the most part are well satisfied with the benefits which they have received.

District No. 12 failed to organize.

District No. 13 contains just 175 acres. It is along the Wabash River just east of Mt. Carmel.

District No. 14 is along Bonpas Creek just south of the mouth of Little Bonpas Creek. It has constructed two miles of ditches, but has no levees and is frequently overflowed, most lately in 1919. This area should also be included in an outlet district.

District No. 15 is a "shoestring" district southeast of Cowling, extending along the edge of the ridge between Wabash River and Bonpas Creek.

District No. 16 is south of Keensburg, and is subject to overflow from the Wabash. It is contained in the proposed Rochester and McCleary Bluffs Levee District.

The newest district in this county is the Allendale No. 1, which has just been completed. The soil is a rich black loam, and the land is valued at \$200 an acre. The district contains 1,040 acres, all of which was overflowed yearly before the construction of the ditches, and 300 acres were entirely worthless. It is believed that all the land in the district will be completely drained.

The old levee along the Wabash extending from the bluffs at Rochester south for a distance of two and a half miles, is followed by a gap of a mile and a half and then by another half a mile of levee. Due to the gap in the levee all of the district is flooded. It is now proposed to strengthen the existing levee and to construct new ones so as to provide a continuous levee from Rochester to McCleary Bluffs. The district will contain 4,500 acres including districts No. 9 and No. 16.

To the north of the proposed district is a stretch of bottom land along the Wabash about five miles long and three-fourths of a mile wide which could be reclaimed. Whether or not it would pay to levee this area is a question which requires further study.

There are 6,300 acres in the southwestern corner of Wabash County which are subject to overflow. One of the plans for improving the bottoms along Bonpas Creek proposes a cut-off between that creek and the river through sections 2 and 11 where the two streams are only 3,500 feet apart. The protection of the overflow area along the Wabash at this point should be studied in connection with the Bonpas project.

Edwards County has two districts in this watershed both of which use the Bonpas as an outlet; and a new one is being organized in the same neighborhood.

The bottoms along Bonpas Creek are sufficiently wide to warrant the formation of an outlet district. There are 24,000 acres, exclusive of the area within organized districts. Considerable discussion has taken place, but thus far nothing definite has materialized. The agricultural advisors of both Edwards and Wabash counties are pushing this movement, and it is only a question of time until an outlet district will be formed. A little educational work on the part of the State would aid materially in forwarding this enterprise, and in securing the proper development of this area.

The eastern six miles of White County drains into the Wabash. Most of the areas in need of drainage either have been or are being reclaimed. There are seven organized districts with a combined area of 15,850 acres, and one district of 24,000 acres is now being organized.

On the edge of the bottoms, southeast of Calvin Station, the Fox River District No. 1 is situated. Its outlet is into Fox River and thence to the

Wabash. It contains 1,320 acres, and its southern portion is not well drained, due to the hill water. This area is included in the new White County District, which contains lands in both Illinois and Indiana. This district proposes the construction of a levee which will give protection to 24,000 acres of Illinois lands.

Six miles east of Carmi, 4,260 acres were organized under the Farm Drainage Act into Hawthorne District No. 2. Although the district has been subject to overflow, it is now contained in the new district, whose levee will protect it.

South of the above district lies the Cat-tail District with 800 acres. It is a tile drainage district, and has no ditches or levee, but is operating successfully.

To the south lies a group of four districts. The largest of these is Emma Township District No. 3, with 4,710 acres. The lower part of this area is not well drained as the ditches are in need of cleaning and deepening to drain the Clear Lake area. To the west is situated Emma District No. 6, containing 1,560 acres, which is giving satisfaction. To the south, 1,200 acres are embraced in Emma District No. 7, and 2,000 acres in the Clark Drainage District. Both are giving successful drainage.

In the southern tip of White County are 8,400 acres of overflow land along the Wabash. The river bounds this area on the east and south and it would require about nine miles of levee to protect it. There is no sentiment toward reclaiming this area and it will probably be some time before any steps are taken in this connection. With this exception, White County is well provided for.

Considerable more reclamation work needs to be done along Wabash River. Thus far the landowners have not given enough consideration to protection from overflow. Most of the districts have simply constructed ditches. The White County Drainage and Levee District is being planned along the right lines, and it is to be hoped that the other areas will profit by this example. A pumping plant is an unknown quantity in this part of the State. The land can be thoroughly reclaimed only by levees and pumping plants. The Russell and Allison District is awakening to this fact, and probably the other districts will in time come to the same conclusion.

CHAPTER XX—EMBARRASS RIVER WATERSHED

There are approximately 2,260 square miles within the Embarrass River watershed, which drains the following counties, wholly or in part: Champaign, Vermilion, Douglas, Edgar, Coles, Clark, Cumberland, Jasper, Crawford, Richland, and Lawrence.

The river has its source in Champaign County, just south of Champaign and Urbana, and flows in a southerly direction to Newton in Jasper County, and thence southeasterly into the Wabash River below Lawrenceville.

The only tributary of any size is North Fork which joins the main stream just below Sainte Marie.

The stream is quite crooked and the length of its channel is about 180 miles while the length of the watershed is 110 miles.

There is overflow along the stream almost throughout its length. In the upper reaches the flooding is not serious, but from the center of Coles County south, the width of overflow varies from a quarter of a mile to about eight miles at the extreme lower end. Along North Fork the valley is from a quarter to one and a half miles in width.

In all approximately 90,660 acres are subject to serious flooding, of which some 31,530 acres are in organized districts and 7,130 acres are now in process of organization. A very small part, however, is satisfactorily reclaimed.

The valley south of Greenup and Moriah has been surveyed by the U. S. Geological Survey in coöperation with the State Geological Survey and maps showing five-foot contours have been published. In 1912 the State Geological Survey secured the services of Mr. J. A. Harman of Peoria for

TABLE 21.—*Drainage data for the Embarrass River watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Union No. 1, Philo and Crittenden.....	Champaign	7,840
2	Embarrass River Special.....	Champaign-Vermilion	24,460
3	Long Point Slough Special.....	Champaign	5,200
4	Crittenden No. 1.....	Champaign	1,680
5	Crittenden Special.....	Champaign	1,480
6	Pesotum Slough Special.....	Champaign-Douglas	5,600
7	Pesotum No. 1 (By User).....	Champaign	3,400
8	Pesotum No. 2 (By User).....	Champaign	1,240
9	Tuscola No. 15.....	Douglas	320
10	Tuscola No. 3 (dissolved).....	Douglas	2,520
11	Tuscola No. 16 (By User).....	Douglas	1,000
12	Hayes Branch, Tuscola.....	Douglas	8,770

TABLE 21.—*Drainage data for the Embarrass River watershed—Continued*

Refer- ence No.	Name of district	County	Area
			<i>Acres</i>
13	Tuscola No. 8 (dissolved).....	Douglas	1,260
14	Tuscola No. 9 (dissolved).....	Douglas	850
15	Tuscola No. 10 (dissolved).....	Douglas	2,060
16	Tuscola No. 4.....	Douglas	2,040
17	Tuscola No. 17.....	Douglas	750
18	Tuscola No. 5.....	Douglas	2,240
19	Tuscola No. 13.....	Douglas	1,860
20	Union No. 15, Arcola and Tuscola.....	Douglas	1,880
21	Union No. 3, Arcola and Tuscola.....	Douglas	1,270
22	Arcola No. 11 (By User).....	Douglas	1,150
23	Arcola No. 14.....	Douglas	780
24	Arcola No. 10 ^a	Douglas	.....
25	Arcola No. 1.....	Douglas	11,500
26	Arcola No. 7.....	Douglas	1,330
27	Arcola No. 2.....	Douglas	5,840
28	Kemp No. 1, Bowdre.....	Douglas	5,510
29	Union No. 1, Bowdre and 7-Hickory.....	Douglas	6,900
30	Union No. 1, Bowdre and Sargent.....	Douglas	2,610
31	Bowdre No. 7.....	Douglas	740
32	Union No. 3, Bowdre and Arcola.....	Douglas	1,330
33	Arcola No. 4.....	Douglas	1,880
34	Union District, Bowdre and Arcola.....	Douglas	510
35	Bowdre No. 8 (By User).....	Douglas	730
36	Camargo No. 1.....	Douglas	2,200
37	Camargo No. 3.....	Douglas	2,770
38	Union No. 4, Camargo and Bowdre.....	Douglas	920
39	Union No. 4, Murdock and Bowdre.....	Douglas	1,470
40	Union No. 2, Murdock and Camargo.....	Douglas	3,780
41	Union No. 4, Murdock and Camargo.....	Douglas	2,300
42	Union No. 1, Murdock and Raymond.....	Douglas-Champaign	2,700
43	Union No. 1, Newman and Murdock.....	Douglas	11,530
44	Union No. 3, Murdock and Newman.....	Douglas	5,150
45	Newman No. 6.....	Douglas	1,480
46	Newman No. 10.....	Douglas	1,940
47	Union No. 5, Murdock and Sargent.....	Douglas	1,450
48	Newman No. 5.....	Douglas	1,280
49	Newman No. 2.....	Douglas	3,760
50	Newman No. 4.....	Douglas	2,440
51	Newman No. 3.....	Douglas	3,260
52	Union No. 5, Young America and Newman.....	Douglas-Edgar	4,070
53	Union No. 1, Sidell and Young America.....	Vermilion-Edgar	3,000
54	Young America No. 4 ^b	Edgar	2,560
55	Young America No. 1.....	Edgar	23,040
56	Union No. 2, Shiloh and Young America.....	Edgar	4,500
57	Shiloh No. 11 ^b	Edgar	.....
58	Shiloh No. 1.....	Edgar	600
59	Shiloh No. 7.....	Edgar	5,150
60	Shiloh No. 2.....	Edgar	5,500
61	Brockton, Embarrass and Shiloh.....	Edgar	5,400
62	Union No. 1, Sargent and Embarrass.....	Edgar-Douglas	1,440
63	Embarrass No. 1.....	Edgar	9,040
64	Standley, Embarrass ^c	Edgar	.....

^aInside Arcola No. 1^bInside other districts.^cInside Brockton.

TABLE 21.—*Drainage data for the Embarrass River watershed—Continued*

Reference No.	Name of district	County	Area
			<i>Acres</i>
65	Union No. 8, Buck and Embarrass.....	Edgar	1,700
66	County Line Special.....	Edgar-Coles	940
67	Kansas No. 2.....	Edgar	1,600
68	Polecat.....	Edgar-Coles	6,890
69	Union No. 1, 7-Hickory and Morgan.....	Coles	900
70	7-Hickory No. 6, (By User).....	Coles	690
71	7-Hickory No. 7, (By User).....	Coles	970
72	7-Hickory No. 1b.....	Coles	2,270
73	7-Hickory No. 2.....	Coles	4,460
74	7-Hickory No. 1a.....	Coles	920
75	Union No. 2, 7-Hickory and Humbolt.....	Coles	2,050
76	Union No. 3, 7-Hickory and Humbolt.....	Coles	3,300
77	Humbolt No. 4.....	Coles	2,510
78	Humbolt No. 1.....	Coles	1,840
79	Ashbrook Mutual, Humbolt and LaFayette.....	Coles	300
80	Homann Mutual, Humbolt and LaFayette.....	Coles	700
81	Union No. 1, Mattoon and LaFayette.....	Coles	2,940
82	Riley Creek.....	Coles	780
83	Kickapoo, Mattoon.....	Coles	2,620
84	Shelhammer Mutual, LaFayette.....	Coles	1,610
85	Loxa, LaFayette.....	Coles	1,430
86	LaFayette No. 1.....	Coles	1,080
87	Cottonwood No. 1.....	Cumberland	580
88	Mint Creek.....	Jasper	1,370
89	Hickory Creek.....	Jasper	690
90	Marsh Creek.....	Jasper	580
91	North Fork.....	Jasper	660
92	Green Briar.....	Jasper-Crawford	4,660
93	North German.....	Richland	1,940
94	Eagle Branch.....	Lawrence	4,800
95	Ambraw River.....	Lawrence	8,830
96	Birds.....	Lawrence-Crawford	5,050
97	Otter Pond.....	Lawrence	4,930
98	Beaver Pond.....	Lawrence	8,000
	Total.....		315,850

Districts being organized

99	Redmon.....	Edgar	1,000
100	St. Marie.....	Jasper	2,200
101	Captain Pond.....	Jasper	4,930
	Total.....		8,130

Overflowed areas

102	Along Embarrass River above mouth of North Fork.....	Coles-Cumberland-Jasper	26,300
103	Along North Fork of Embarrass River.....	Clark-Crawford	13,700
104	Along Embarrass River.....	Crawford-Lawrence	12,000
	Total.....		52,000

TABLE 21.—*Drainage data for the Embarrass River watershed—Concluded*

Reference No.	Name of district	County	Area
<i>Upland areas needing drainage</i>			
105	West of Paris.....	Edgar	<i>Acres</i> 12,000
106	Between Hidalgo and Rose Hill.....	Jasper	500
107	Near Hunt City.....	Jasper	500
108	Between Boos and West Liberty.....	Jasper	600
	Total.....		13,600

the purpose of making a study of the overflowed conditions and the remedy thereof. In 1913, Bulletin No. 25 was issued by the Survey, containing Mr. Harman's report and plans for the reclamation of the lands subject to overflow in the Embarrass River Valley. In these plans a number of cut-offs are provided to eliminate the large loops and bends in the channel whenever the resulting cost was not excessive. The length of the present channel from the mouth to Greenup is 103.8 miles. With the proposed cut-offs the length would be 80.7 miles, a reduction of about 23 per cent. The bottom area along the Embarrass and North Fork was divided into 26 drainage units, each of which formed a natural sub-division, caused by the winding course of the river channel, which could be reclaimed independently. The estimated cost of the proposed work, as of Jan. 1, 1913, is given as follows:

	<i>Per acre</i>
River channel correction	\$ 3.00
Protection from overflow (by levees)	14.00
Completion of interior drainage	3.00
Pumping plants where necessary	5.00
Total average cost of reclamation works.....	\$25.00
Add for organization, administration and incidental expenses, 20%...	5.00
Total probable average cost, including all expenses.....	\$30.00

At present prices the cost would be about 50 per cent greater than that given which was based on 1913 prices.

The conclusions and recommendations contained in Mr. Harman's report are in part as follows:

1. That a large amount of fertile land lying in the Embarrass River valley, subject to overflow, and comparatively useless for agricultural purposes, may be reclaimed and made available for profitable farming.

2. That the benefits to be derived from the improvements of these lands will be in excess of the cost, and for many of the drainage units the cost will be very much less than the benefits.

3. That a drainage and levee district should be organized, including that portion of the Embarrass River valley which is covered by this report. The officers for this district should have charge of the channel corrections and of the work of each drainage unit.

4. That the legislature of the State be requested to enact a workable law under which such an organization may be effected. Such a law should provide that the general improvement of correcting the river channel might be charged as a cost to all the lands which would be benefited thereby, and that the improvements for protection from overflow and for interior drainage might be charged wholly to the lands within the drainage unit so protected, and that the carrying out of the local improvements for each drainage unit should be a matter to be determined independently of the work of any other drainage unit.

5. That the correction of the main channel should be carried out as a whole, and with as much expedition as possible after it has been undertaken. The protection from overflow of each drainage unit, and the interior drainage thereof, which would include ditches and pumping station, where necessary, could be done progressively.

Until recently the landowners have not availed themselves of these plans and the result of the effort of the State to assist in the reclamation of the bottom land has been rather disappointing. Recently several districts have been constructed, or are now planning organizations, which have used the above plans in a modified form. These will be discussed in detail later.

Table 21 gives the drainage data for this watershed. It will be observed that 98 districts with a total area of 315,850 acres have been organized and that three districts are now being formed which will increase the above total by 8,130 acres. These together represent 22.5 per cent of the watershed area, and 78 per cent of the area originally in need of drainage. This watershed ranks sixth among the watersheds of the State as regards the amount of drainage work already accomplished.

Of the 98 organized districts, 82 are north of the railroad between Mattoon and Charleston, and are located on the upland prairie away from the river. In fact, this area is practically covered with districts and there is a considerable amount of overlapping, especially in Douglas County. Many old districts have been dissolved and the area contained in them reorganized into larger districts. This entire area is thoroughly drained and the land ranges from \$400 to \$450 in value. Within the last few months, a movement has been initiated to form a large outlet district along the river from a point about four miles north of the Champaign-Douglas County line to the Big Four railroad bridge in Coles County. The purpose of this project is to dredge the river and provide a better outlet for the many districts which drain into it. However, the movement is meeting with strong opposition and it is extremely doubtful if it will materialize at this time. Nevertheless it is an improve-

ment which will eventually be made, since the natural channel can not carry the extra load imposed upon it during floods because of the more rapid run-off caused by the artificial drainage of the flat upland. In making an improvement of this kind care must be taken not to go to extremes and thereby place an unnecessary burden upon the landowners.

Drainage in this portion of the State has been very successful and has been the making of the land from an agricultural standpoint.

West of Paris a wet area is indicated on the map. This area is producing good crops and is not seriously damaged by lack of better drainage, but is not as well drained as the surrounding lands. Possibly more individual tiling is all that is needed here. The opinion of practically all of those consulted was that no more organized drainage was needed in these counties.

No districts have been organized in the southern portion of Coles or in the western part of Clark County, and so far as could be ascertained none are needed, except in the Embarrass and North Fork valleys, respectively, where the area subject to overflow is from a quarter to half a mile in width.

In Cumberland County there is one district, the Cottonwood No. 1, with 580 acres. The overflow along the river here is over a mile in width and extends up Cottonwood and Hurricane Creeks.

In Jasper County the valley is about two miles in width. The total amount of overflowed area north of the mouth of North Fork is approximately 26,300 acres, exclusive of the area contained in organized districts and those being organized. North of Newton there are two districts: the Mint Creek District with 1,370 acres west of the river and the Hickory Creek District with 690 acres on the east. The former district includes about one-half of the area contained in Unit No. 13 as planned in Bulletin No. 25 of the State Geological Survey, previously mentioned. The district was organized in 1910, and completed in 1915. No attention seems to have been given to the recommendations in Bulletin No. 25, probably because it was published too late to be of any assistance. No levees were constructed for flood protection and no diversion ditch for intercepting the hill waters. The commissioners place a value of \$100 an acre upon the land. The Hickory Creek District is in about the same condition. Since this county was visited and after the drainage map had been completed, a new district has developed which will include both of these districts as well as the remainder of the bottom land in Wade Township. By river the distance is twelve miles, while the air-line distance is about six miles. The proposed plans provide for the straightening of the channel and the construction of levees.

Southeast of Newton, 580 acres are organized in the Marsh Creek Drainage District. This area is the same as that included in Unit No. 11 of the Embarrass River report. The plans there given were not followed, no levees have been constructed and consequently the area is still subject to overflow and is not in much better condition than the adjoining lands.

North of Sainte Marie, 2,200 acres of bottom land on the west side of the river is practically organized into the Sainte Marie Drainage District. The area is the same as that embraced in Unit No. 9 of Mr. Harman's report, and the plans recommended by him are being followed with the exception that more channel improvement is provided for.

South of Sainte Marie, the new Captain Pond District will reclaim all the bottom land to the south line of Jasper County. There are 4,930 acres in this tract which is the same as that in Units 7 and 8 of the report. It is planned to change the channel of the river to the east bluff and thus throw all of the area on the west side of the river. Levees will be constructed to protect the land from overflow. The plans are comprehensive and should give complete protection. The assessment will be about \$65 an acre.

Directly south of the above district in Richland County the North German District is situated. It was organized in 1911 and contains 1,940 acres. No levees have been constructed and the land is little better off than before. The present value of the land is about \$40 an acre. To the northeast, on the north side of the river, the Green Briar District has reclaimed 4,660 acres. It is a levee district and has just been completed. It has the only pumping plant along the river, and will undoubtedly prove successful. The area is practically the same as that in Unit No. 6 of the Report and the plans therein recommended were followed with a few unimportant exceptions.

Four miles northeast of Sainte Marie, along North Fork, 660 acres were organized into the North Fork District in 1916, but thus far the commissioners have let no contracts.

The overflowed area along North Fork of Embarrass River averages a mile or more in width and extends northward to about the middle of Clark County. About 13,700 acres here are subject to reclamation.

Below the Green Briar District the valley is from two to five miles in width and presents the most feasible reclamation project along the entire stream, yet nothing has been done as far south as Westport. From here most of the bottom land as far south as Lawrenceville is contained in two districts, namely, the Eagle Branch and the Ambraw River. The former was organized in 1903 and included 4,800 acres. It is overflowed annually, and its ten miles of ditches have increased the value of the land from about \$30 an acre at time of organization to \$50 an acre at present.

The Ambraw River District contains 8,830 acres and was formed for the purpose of channel improvement. A new channel six miles long was dredged as straight as it could be made. The result is that the flood heights at the upper end of the district are about one and one-half feet lower than before, while at the lower end they are about the same amount higher. No levees were constructed by the district, and the land is overflowed as before, except where individuals have constructed private levees.

Around Birds Station a district of that name was formed in 1909 to include 5,050 acres. Twelve miles of ditches have been dredged but the district has been only partially successful. It was flooded in 1912, 1915, 1917, and 1919, and drainage sentiment is not very enthusiastic. The land has risen in value from \$40 an acre to \$75.

Northeast of Lawrenceville the Beaver Pond and the Otter Pond Districts are located. They contain 4,930 acres and 8,000 acres, respectively. Both are old districts, the former having been organized in 1891 and the latter in 1898. Neither district is entirely successful and is overflowed almost every year. Both are contained within the Ambraw Levee District which has constructed a levee along the Embarrass River from the high ground east of Lawrenceville to the Wabash River levee of the Russell and Allison Levee District. There is another short levee north of Lawrenceville to keep out the water from that direction. The protection has not been satisfactory and new and stronger levees are needed both on Wabash and Embarrass Rivers. To the east along the Wabash are other districts which are discussed under the Wabash River watershed. It is proposed to unite all of these districts under one set of commissions since there is one common problem involved, that of preventing overflow from the two rivers. A pumping plant is proposed at the end of the ditch of the Beaver Pond District.

Although nine districts have been organized in the Embarrass River bottoms, only one has given satisfaction, and that one is the Green Briar which has just been completed. It is successful because it has complete protection from overflow and a pumping plant to remove the water which collects behind the levee during flood periods. The two new districts near Sainte Marie will undoubtedly accomplish all that is expected of them, because they are being planned in a thorough manner.

All of the overflowed land in this valley can be reclaimed and very profitably so, if properly planned. Half-way measures are rarely successful and along streams such as the one in question, ditches without levees are of little value.

As recommended by Mr. Harman in 1913, the correction of the main channel should be carried out as a whole. Improving a portion of a stream does little good if the channel below the improvement is restricted. This is well illustrated by the channel improvement above Lawrenceville, which causes higher water at the lower end than formerly. The same will be true of the channel corrections planned by the two new districts. Here the case is somewhat different due to the fact that levees are to be constructed but such levees will have to be higher and stronger than would be necessary were the improvements continued downstream.

Where reclamation work is done piece-meal as in this valley, care must be taken by each district to leave sufficient flood-way between levees or between a levee on one side and the bluff on the other. The widths recommended

in Bulletin No. 25 can be safely followed, and should by no means be decreased.^a

The principal obstacle which is delaying the reclamation of the bottom land in this valley is a lack of knowledge on the part of a large portion of the landowners as to the engineering and economic aspects of the problem. If these men could see the lands in the Illinois valley, for example, which have been protected by levees and drained by ditches and pumping plants, and talk to owners of the land as to the investment phase of their undertakings, their objections would be largely removed. As it is they feel that the expense of reclamation is too great and that signing a petition for a drainage district will ruin them.

There can be no doubt that the reclamation of this bottom land is an excellent investment if the drainage works are correctly planned and executed. It is to be hoped that the drainage sentiment which has developed around Sainte Marie will spread throughout the entire valley and that the natural wealth which lies in the fertility of the now waste bottom lands will be utilized.

^aSee chapter XXXI.

CHAPTER XXI—KASKASKIA RIVER WATERSHED

The watershed of the Kaskaskia is the second largest in the State and covers 5,670 square miles. It extends from the center of Champaign County in a southwesterly direction to the Mississippi River near the city of Chester. Its length is about 180 miles and its average width about 30 miles, with an extreme width of 55 miles.

The Kaskaskia River which flows through the approximate center of the watershed has a very crooked channel with slight fall and low banks. The distance by channel is over 300 miles, while the total fall is about 390 feet.

Through Champaign and Douglas counties the bed of the river is little lower than the adjacent prairie land; but through Moultrie and Shelby counties a distinct valley has been cut and the river winds its way through a valley from an eighth of a mile to one and a half miles in width. The topography is rough and prevents any worth-while channel correction.

In Fayette County the valley widens to about three miles and continues so to Carlyle in Clinton County. For a short distance south, it narrows to about one mile, and then again widens to an average width of three miles as far south as New Athens. From this point to the mouth of the river, the width averages about one mile.

Due to the size of the watershed and to the consequently large volume of water entering the valley during storm periods, and to the low banks and crooked channel, the valley below the Shelby-Fayette County line is subject to serious flooding. Above this point there is also some overflow, but the valley being narrow, a more complicated problem is presented.

The most disastrous flood of which there is record, occurred from May 3 to 15, 1908. All of the bottom land was flooded from three to ten feet deep. At Vandalia the river was out of its banks till May 27th, at Carlyle until June 3d, and at New Athens until about June 6th.

Other extremely high floods occurred in 1875, 1882, 1898, 1907, 1911, 1913, and 1915. Minor floods, sufficient to destroy crops occur nearly every year.

The uncertainty of harvesting a crop from the bottom land is such that only small portions here and there are under cultivation and a large part of the land is still in timber. However, the land is so fertile and produces so abundantly that it is a continual temptation to the owners to farm it and take a chance on harvesting a crop.

The drainage data for the watershed are given in Table 22. The present status of drainage in the several portions of watershed will be given in order beginning at the upper end.

That portion of the watershed lying north of the Cincinnati, Indiana and Western Railroad between Decatur and Tuscola is completely covered with

drainage districts. Twenty-nine have been organized in this area and contain a total of 219,200 acres. One of these, the Lake Fork Special, contains 44,220 acres; a second, the Two-mile Slough, covers 21,000 acres; a third, the Fountain Head, has 19,900 acres; a fourth, the Okaw, drains 18,100 acres; and a fifth, the East Lake Fork, embraces 17,340 acres. There are four others which contain between 10,000 and 15,000 acres each. So it is seen that drainage work here has been carried out in a very comprehensive manner.

TABLE 22.—*Drainage data for the Kaskaskia River watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Fountain Head.....	Champaign	19,900
2	Kaskaskia Mutual (Included in Fountain Head).....	Champaign	.....
3	Kaskaskia Special.....	Champaign	10,620
4	Two-mile Slough.....	Champaign	21,000
5	Union No. 12, Tuscola-Pesotum ^a	Douglas-Champaign	720
6	Okaw.....	Champaign-Douglas	18,100
7	Dry-Fork Mutual.....	Champaign	1,900
8	East Lake Fork.....	Champaign	17,340
9	Kankakee.....	Champaign-Piatt	11,400
10	Monticello No. 2.....	Piatt	4,500
11	Monticello and Bement Mutual No. 2.....	Piatt	2,700
12	Lake Fork Special.....	Champaign-Piatt	44,220
13	Bement Mutual No. 3.....	Piatt	320
14	Bement Mutual No. 1.....	Piatt	2,400
15	Union Mutual No. 4, Bement, Willow Branch and Cerro Gordo.....	Piatt	2,500
16	Cerro Gordo No. 4.....	Piatt	7,500
17	Union No. 3, Cerro Gordo and Willow Branch.....	Piatt	13,460
18	Cerro Gordo No. 2.....	Piatt	4,240
19	Cerro Gordo No. 1.....	Piatt	4,200
20	Union No. 5, Cerro Gordo and Long Creek.....	Piatt-Macon	920
21	Union No. 6, Cerro Gordo and Long Creek.....	Piatt-Macon	1,760
22	Union No. 7, Cerro Gordo and Lovington.....	Piatt-Moultrie	1,640
23	Union No. 1, Unity and Lovington (User).....	Piatt-Moultrie	2,100
24	Unity No. 9.....	Piatt	2,500
25	Hammond Mutual.....	Piatt-Moultrie	8,060
26	Unity No. 3.....	Piatt-Moultrie	8,440
27	Unity No. 2.....	Piatt	1,100
28	Unity No. 7.....	Piatt	4,000
29	Garrett No. 2.....	Douglas-Champaign	10,670
30	Union No. 1, Garrett and Bourbon.....	Douglas	4,170
31	Lowe No. 1.....	Moultrie	1,680
32	Lowe No. 4.....	Moultrie	2,080
33	Lowe No. 7.....	Moultrie	2,160
34	Lowe No. 2.....	Moultrie	3,280
35	Lowe No. 5.....	Moultrie	5,560
36	Lovington No. 1.....	Moultrie	1,440
37	Lovington.....	Moultrie	1,240

TABLE 22.—*Drainage data for the Kaskaskia River watershed—Continued*

Reference No.	Name of district	County	Area
			<i>Acres</i>
38	Hostetler.....	Moultrie	1,240
39	Union No. 6, Jonathan, Lovington and Lowe.....	Moultrie	2,680
40	Lovington No. 2.....	Moultrie	640
41	Sullivan No. 1.....	Moultrie	560
42	Sullivan No. 2.....	Moultrie	2,560
43	Union No. 1, Lowe and Jonathan Creek.....	Moultrie	3,200
44	Jonathan Creek No. 4.....	Moultrie	2,310
45	Caldwell.....	Moultrie	3,700
46	Mast Union No. 1, Lowe and Jonathan Creek.....	Moultrie	3,200
47	Jonathan Creek No. 2 (By User).....	Moultrie	520
48	Union District.....	Moultrie-Coles-Douglas	4,900
49	Union Special.....	Coles-Moultrie	2,930
50	North Okaw No. 8.....	Coles	1,810
51	North Okaw No. 6.....	Coles	1,040
52	North Okaw No. 11 (By User).....	Coles	640
53	North Okaw No. 13.....	Coles	820
54	North Okaw No. 10 (By User).....	Coles	240
55	Okaw No. 12 (By User).....	Coles	1,200
56	Okaw No. 9 (By User).....	Coles	720
57	Union No. 9 Bourbon and North Okaw.....	Douglas-Coles	610
58	Bourbon No. 1.....	Douglas	7,220
59	Bourbon No. 3 ^b	Douglas	
60	Union No. 1, Bourbon and Arcola.....	Douglas	1,900
61	Union No. 13, Arcola and Bourbon.....	Douglas	1,440
62	Union No. 15, Arcola and Bourbon.....	Douglas	1,330
63	Arcola No. 12.....	Douglas	450
64	Arcola No. 5 (dissolved).....	Douglas	1,200
65	Arcola No. 6.....	Douglas	1,160
66	Union No. 8, Arcola and Humbolt.....	Douglas-Coles	2,560
67	Humbolt No. 5.....	Coles	4,000
68	Union No. 2, North Okaw and Humbolt.....	Coles	2,430
69	Union No. 1, Humbolt and North Okaw.....	Coles	2,430
70	Union No. 1, Mattoon and North Okaw (User) ^b	Coles	
71	North Okaw No. 3.....	Coles	3,280
72	Brewster-Rice.....	Coles	1,720
73	Mattoon No. 2.....	Coles	2,860
74	Whitley Mutual No. 1.....	Moultrie	720
75	Whitley No. 1.....	Moultrie	780
76	Union No. 1, North Okaw and East Nelson.....	Coles-Moultrie	520
77	East Nelson No. 1.....	Moultrie	700
78	Asa Creek.....	Moultrie	780
79	Sullivan Mutual No. 1.....	Moultrie	720
80	Dora Mutual No. 4.....	Moultrie	600
81	Dora Mutual No. 1.....	Moultrie	1,280
82	Union No. 1, Penn and Pickaway.....	Shelby	790
83	Union No. 1, Todd's Point and Pickaway.....	Shelby	960
84	Union No. 1, Okaw and Todd's Point.....	Shelby	2,560
85	Okaw No. 1.....	Shelby	2,920
86	Union No. 1, Pana and Rural.....	Christian-Shelby	2,160
87	Oconee No. 1.....	Shelby	710
88	Prairie No. 2.....	Shelby	2,400
89	Prairie No. 1.....	Shelby	2,000
90	Pepper Mill.....	Fayette	1,790
91	Dively Levee and Drainage.....	Fayette	1,300
92	Vandalia Levee and Drainage.....	Fayette	15,000

^bInside other districts.

TABLE 22.—*Drainage data for the Kaskaskia River watershed—Continued*

Reference No.	Name of district	County	Area
			<i>Acres</i>
93	Union No. 1, Bear Grove and Vandalia.....	Fayette	4,500
94	Meridian Line.....	Fayette	600
95	Pond Lily.....	Fayette	340
96	Fish Lake.....	Fayette	5,000
97	Pecan Island.....	Fayette	660
98	Wildcat.....	Fayette	5,700
99	Grassy Lake.....	Fayette	3,500
100	Soper Lake.....	Fayette	3,600
101	Tamalco No. 1.....	Bond	2,560
102	Sante Fe No. 2.....	Clinton	1,200
103	Sante Fe Drainage and Levee.....	Clinton	3,000
104	Germantown.....	Clinton	980
105	Hanover.....	Clinton	3,400
106	Union No. 1, Harvel and Pitman.....	Montgomery	1,600
107	Harvel No. 2.....	Montgomery	1,840
108	Union No. 1, Janesville and Pitman.....	Montgomery	2,140
109	Union No. 1, Harvel and Raymond.....	Montgomery	2,120
110	Raymond No. 2.....	Montgomery	450
111	Raymond No. 3.....	Montgomery	730
112	Union No. 1, Raymond and Rountree.....	Montgomery	3,720
113	Raymond No. 1.....	Montgomery	840
114	Silver Creek.....	Madison	1,100
115	Silver Creek No. 1, O'Fallon.....	St. Clair	4,190
116	Richland Creek No. 1.....	St. Clair	2,710
117	Richland Creek No. 2.....	St. Clair	2,150
118	Richland Creek No. 3.....	St. Clair	1,900
119	Richland Creek No. 4.....	St. Clair	700
120	Horse Prairie.....	Randolph	400
	Total.....		419,640

Districts being organized

121	Extension of Garrett No. 2.....	Douglas	2,070
122	Dora Township.....	Moultrie	1,100
123	Pickaway.....	Shelby	920
124	Kaskaskia River Outlet.....	Fayette-Bond-Clinton	32,450
125	Blue Grass Creek, Butler Grove and Raymond.....	Montgomery	3,480
126	New Douglas No. 1.....	Madison	1,480
127	Upper Shoal Creek.....	Bond	8,000
128	Lower Shoal Creek.....	Clinton	9,200
129	Heimann.....	Clinton	1,100
130	Silver Creek No. 2, Shiloh Valley.....	St. Clair	6,520
131	North Richland Creek.....	St. Clair	200
	Total.....		66,520

Overflowed areas

132	Along Kaskaskia River and tributaries.....	Moultrie-Shelby	12,300
133	Along Wolf Creek.....	Effingham-Fayette	3,600
134	Along Mitchell and Becks Creek.....	Fayette-Shelby	2,700
135	Along Big Creek.....	Fayette	1,500
136	Along Boaz Creek.....	Fayette	1,000

^aThere are 69,000 assessable acres in this district, of which 36,550 acres are in existing districts.

TABLE 22.—*Drainage data for the Kaskaskia River watershed—Concluded*

Refer- ence No.	Name of district	County	Area
			<i>Acres</i>
137	Along Hickory Creek.....	Fayette	1,500
138	Along Hurricane Creek.....	Fayette	6,500
139	Along East Fork Kaskaskia R. and Bear Creek....	Fayette	4,500
140	Along Crooked Creek and Tributaries.....	Clinton-Washington- Marion	14,800
141	Along Kaskaskia River, Carlyle to mouth .....	.....	71,800
142	Along Shoal Creek.....	Montgomery-Bond	8,400
143	Along East Branch Shoal Creek.....	Bond	4,500
144	Along Beaver Creek and Lower Shoal Creek.....	Clinton	4,700
	Total.....		137,800

Upland areas needing drainage

145	Bourbon and Arcola Townships.....	Douglas	1,700
146	Lone Grove Township.....	Fayette	800
147	Old Ripley Township.....	Bond	1,500
148	East of Belleville.....	St. Clair	7,500
149	Between Mascoutah and Lebanon.....	St. Clair	10,000
150	Southeast of Mascoutah.....	St. Clair	5,000
151	Near Darmstadt.....	St. Clair	4,000
152	West of Marissa.....	St. Clair	11,000
	Total.....		41,500

South of the above mentioned railroad the land as far south as Sullivan and Mattoon is all in districts with the exception of a strip three or four miles wide along the river where the natural drainage is better. There are 53 districts in this portion of the watershed with a combined area of 107,000 acres. The largest district contains 7,220 acres and there are 16 with less than 1,000 acres each.

Most of the 89 districts mentioned have been successful and the land is well drained. The larger ones have for the most part been the most successful and have better ditches and maintain them in better condition. More tiling is needed in a number of the districts especially in those in Moultrie County.

The Okaw River District was partially formed for straightening the river through Douglas County, but was abandoned by petition before it had been fully organized. Conditions are not yet ripe for this improvement, but it undoubtedly will be carried out at some future time. The artificial drainage of all the surrounding land has greatly increased the flood flow of the stream through both Douglas and Coles Counties.

In the northwest part of Moultrie County there are several small mutual districts whose boundaries could not be obtained. Due to the activity of the

Farm Advisor of Moultrie County, a considerable interest is being manifested in farm drainage. At a drainage meeting held in July, 1920, the statement was made that only about ten per cent of the cultivable area was satisfactorily drained. A large amount of individual work may be expected here during the next few years. The southern part of this county has good natural drainage.

Very little work has been done in Shelby County, and very little has been needed. There is greater relief in the topography here than in the surrounding counties. In the northern part of this county a group of four districts occupies the upland prairie between Robinson and West Okaw creeks, and a fifth is in process of formation. The combined area of the five is 8,150 acres. In the southeastern portion of this county there are two small districts together containing 4,400 acres. The drainage problem is confined to the valley of the river and a few of the larger creeks. The width of the valley subject to overflow varies from a quarter to one mile, and the total amount of land thus affected is approximately 12,300 acres. The valley is not wide enough for the construction of levees and too far below the level of the adjoining land to permit of any considerable amount of channel correction. About all that can be done here is to clean out the channel. The proposed straightening of the channel through Fayette County would prove of benefit to the Shelby County land. There has been some talk of constructing a 40-foot dam at Shelbyville for electric power development; but owing to the rather uncertain economic features of the project, the matter has not gone very far.

In Fayette County eleven districts have been organized, eight of which lie in the river bottoms. The three upland districts form a group west of Vandalia. The largest of these is Union No. 1 of Bear Grove and Vandalia townships, which provides satisfactory drainage to 4,500 acres. The Meridian Line and Pond Lily are small districts of 600 and 340 acres, respectively, and have been only partially successful. All have their outlets into Raccoon Slough, which should be dredged, thus giving better drainage to the surrounding area.

Opposite the mouth of Big Creek, 1,790 acres of bottom land were combined in the Pepper Mill Drainage District in 1908. Three miles of ditches and one mile of large tile constitute the drainage work of this district. No levees were constructed and the tract is frequently inundated. The land has increased in value from \$35 an acre in 1908 to about \$50 an acre at present.

Several miles downstream, and on the east side, the Dively Levee and Drainage District was organized in 1911 for reclaiming 1,300 acres of bottom land. A levee two and one-half miles long and three miles of ditches were constructed. The levee protects the land except in extreme floods such as occurred in 1913 and 1915. No pumping plant has been built and when the river is high the district suffers from the hill water which collects behind the levee. The land here is also valued at about \$50 an acre.

Directly south of the Dively District, the Vandalia Levee and Drainage District is located. It is the largest organization of its kind in the valley and contains 15,000 acres. It was formed in 1903 and has twelve miles of levee and eight miles of interior ditches. The levee is connected with the bluffs on the north—as it was constructed before the Dively levee—but is open at the lower end where the main ditch enters the river, and is subject to back-water during high stages of the river. The levee is too close to the river and restricts the flood flow. It frequently breaks and the district was entirely inundated in 1908, 1911, 1913, and 1915. About 1,000 acres within the district are not yet cleared of timber. The commissioners realize the need of higher levees and deeper ditches; but these improvements will probably not be made until after the new outlet district is constructed, when its levees may prove of sufficient height. The land here is also valued at about \$50 an acre.

About four miles south of Vandalia, the river divides and flows on each side of Pecan Island, which contains about 1,000 acres. The Pecan Island Levee District has constructed a levee around the Island, which gives protection to 660 acres. Definite information concerning the success of this undertaking was not obtained.

West of Pecan Island lie 5,000 acres of bottom land within the Fish Lake Drainage District which was organized in 1905. This project has not turned out satisfactorily, since no levees were constructed and the land is flooded every year more or less. The land is valued at about \$30 an acre.

The Wildcat Drainage District occupies the valley below Pecan Island. It was formed in 1905 and contains 5,700 acres. The area is not leveed and is overflowed almost every year. Eight miles of ditches comprise the drainage works of the district. The commissioners give the value of the land as \$50 an acre.

The Grassy Lake District includes 3,500 acres north of the mouth of Hurricane Creek. It has no levees and completed its six miles of ditches in 1909. It also is flooded nearly every year, and its land is worth about \$40 an acre.

The last river district, the Soper Lake, lies in the east bottoms between Hurricane and Bear Creeks. There are 3,600 acres in the district which was formed in 1908. It has no protection against overflow and is flooded every year. The ditches carry off the surface water satisfactorily, but without protection from overflows, the bottom land has very little value. The commissioners place a valuation of \$20 an acre on the land.

From the above brief description of the eight districts in the Kaskaskia valley, it is evident that little reclamation has been accomplished.

In 1908, the Kaskaskia valley from Cowden Bridge to the mouth of the river was surveyed and mapped by the State Geological Survey in coöperation with the U. S. Geological Survey. Special drainage maps were prepared so

that an intelligent study of the situation might be made by the Internal Improvement Commission of Illinois, which had agreed to do so provided the maps were furnished. This Commission employed Mr. J. A. Harman of the Harman Engineering Company of Peoria, to make plans for the reclamation of the overflowed lands along the Kaskaskia as far north as Cowden Bridge. Before the completion of the work, the activities of the Internal Improvement Commission were transferred to the newly appointed Rivers and Lakes Commission, which completed the reclamation studies and published Mr. Harman's report in 1912. One of the essential elements of Mr. Harman's investigation was the amount of channel straightening which would be profitable and economical. By such channel correction the maximum flood stage and the duration of floods were to be reduced. The findings and conclusions in this connection were briefly as follows:

1. The distance from the Mississippi River to Cowden Bridge by the old channel is 196.4 miles, while the median distance is 122.1 miles.

2. By the maximum amount of straightening it was possible to reduce the length of channel to 132.6 miles, or only 10.5 miles more than the median distance. This plan called for 44.3 miles of new channel and was not considered justifiable from the standpoints of cost and of the benefits to be derived therefrom.

3. The route adopted was 148.1 miles long of which 18 miles represented new channel. The maps accompanying the report showed the location of the proposed cut-offs. The straightening of the channel was considered the first step in the reclamation work, but this alone would not prevent the flooding of the land. The plan grouped the overflowed areas into 28 drainage units, for each of which levees and bluff diversion ditches were provided. The area in each unit was such that it might be reclaimed independent of any other unit.

The estimated cost of the reclamation work outlined in the report is as follows:

	<i>Per acre</i>
Channel improvement	\$ 6.70
Levees and diversion ditches	19.10
Interior drainage, either by pumps or gravity outlets.....	8.00
Right of way, contingencies, engineering, administration, etc. (20%)	8.45
Total average cost per acre.....	<hr/> \$42.45

At present prices the above estimate should be increased about 50 per cent.

The conclusions and recommendations given in the report are as follows:

1. That the Kaskaskia valley contains a very large and fertile tract of land, which is now subject to overflow and in many respects worse than use-

less, but which may be reclaimed and made available for profitable farming.

2. That the total benefits to be derived from the reclamation of this land will be from 50 to 100 per cent more than the cost of such improvements.

3. That in order to carry out such an improvement effectively and efficiently it will be necessary to provide an organization to administer and control the entire improvement as a unit, and to maintain the improvement in a high state of efficiency after construction.

4. As there is no law in the Illinois statutes under which such an organization can be readily effected, we recommend that a new drainage law be enacted which would be effective for the organization and management of large areas of overflowed and swamp lands.

5. That the provisions of such a law should make it possible to carry out the general improvements at the cost of all the lands within the drainage district, and subsequently to develop each drainage unit at the cost of the land in such unit when the owners of the land shall desire the same to be done.

6. That the development of such an area of land should be progressive: (1) The correction of the main stream channels; (2) the development of the drainage units.

Following the publication of the above report, the more progressive landowners initiated a movement to secure the passage of an act, such as outlined in recommendations 4 and 5. A bill was introduced in the 1915 Legislature, but failed to pass. A second attempt was made in 1917 and resulted in the passage of Section 65a, known as the "Outlet District Act." Following the placing of this law on the statute books, steps were taken to organize an outlet district embracing all the bottom land in Fayette, Bond, Clinton, Washington, and St. Clair counties. However, so much opposition was met with from the landowners in Washington and St. Clair counties, that these were dropped from consideration, and a petition was prepared covering the lands in Fayette, Bond, and Clinton counties as far south as Carlyle. Everything was going smoothly when war conditions delayed progress for the time being. After the war, the matter was again taken up, the petition was filed, and Commissioners were appointed to investigate and report upon the feasibility of the project. The name given to the district is the Okaw Valley Outlet Drainage District. The report of the commissioners was filed in the Fayette County court December 4, 1920. Considerable opposition has developed at the lower end of the district and the case is still in court.

There are approximately 69,000 assessable acres in the proposed district of which 36,550 acres are within the eight organized districts previously mentioned. The area is shown on the map with reference number 124.

The route of the channel proposed in the petition did not follow that recommended in the report of the Rivers and Lakes Commission. Many long cut-offs were substituted for the shorter ones of the report, thus increasing the length of new channel. After new surveys had been made the com-

missioners, upon the advice of their engineers, decided that the route proposed in the petition was not the most feasible one.

Since the fate of this district will have an important bearing upon the reclamation of other bottom lands, and since the proposed plans should prove of interest to the owners in other valleys it is thought advisable to quote a portion of the Commissioner's and Engineers' Report.

"A detailed examination of the present channel of said river discloses the fact that said channel is so winding and tortuous that practically no part of said river channel can be utilized in the construction of a new channel without material interference with the proposed object of said petition. We are advised and herein find that to follow the line outlined on said plot attached to said petition would involve the expenditure of as much or more money than the route hereinafter proposed. In the construction of said improvement as proposed in the petition the dredge boat constructing said improvement would at short intervals be compelled to enter and leave the present channel to make a cut-off through the lands, the construction of a dam would be required to impound sufficient water to permit the boat to approach properly the bank to be cut, that the stretches of river which might be used would be so short from a practical standpoint that contractors on said work would be required to make higher charges for earth actually removed, so that it is believed a practically continuous channel may be constructed at an expense not to exceed the cost of the channel proposed in said petition. * * * * The principal fact, however, which determined your commissioners to recommend the route hereinafter proposed is the fact that they are advised and here find that the route so hereinafter proposed will be constructed through a lower portion of the flood-way and will more effectually produce the result of relieving the lands included within the boundaries of said district of the flood waters of said Kaskaskia River than the route proposed in said petition."

The proposed route consists of a series of straight lines joining the five railroad or highway bridges which cross the stream, and is a very radical plan of channel improvement. In this connection the reader is referred to Chapter XXX of this report. The estimated cost of the improvement is \$30 an acre.

There is also some overflowed land along the several creeks which enter the river in the stretch covered by the proposed outlet district. These are indicated on the map and the area of each is given in Table 22. There are about 21,000 acres of such land along these streams.

Below Carlyle in Clinton County, four districts have been organized. The largest and most nearly reclaimed area is in the Santa Fe Drainage and Levee District, which contains 3,000 acres just southeast of Bartleso. The tract is entirely surrounded by levees. On the side toward the river the levee is over a mile from the river bank and is high enough to prevent over-

flow except in extreme floods. The ditches are of ample size and are in excellent condition. At the southwest corner of the district an 18-inch pump is installed which is entirely inadequate to handle the water from the 3,000 acres in the district and from some 2,000 acres of hill land, with the result that the lower end of the tract is covered with water for several days during flood periods. The upper land has a value of about \$75 an acre, while the lower land is little better off than the land outside the district, and the owners of this land are now suing the district for damages.

Santa Fe No. 2 is directly east and covers only 900 acres. No levees have been built and the land is frequently flooded.

The Germantown District joins the Santa Fe Levee District on the west. It has a small levee which is overtopped during extreme storms such as occurred in 1908 and 1915. The water backs into the district from the Shoal Creek side, and the commissioners are now planning to construct a levee which will prevent this. The district is considered a success and the land is valued at about \$100 an acre.

The Hanover Drainage District is just north and west of the Germantown District and contains 3,400 acres. It has one short levee between it and the Germantown District, but no protection from overflow from either Kaskaskia River or Shoal Creek.

Between Shoal and Sugar creeks, 1,100 acres are now being formed into the Heiman Drainage District.

If the channel above Carlyle is straightened, the flood heights throughout this part of the valley will be greater and the land overflowed more frequently. In this case, either the improvement will have to be continued downstream or else the landowners will have to abandon the bottom land. This is the widest part of the valley and presents ideal conditions for profitable reclamation. However, there is little or no interest taken in the bottom land and it is likely to remain in its present useless state for some time to come.

The overflowed area along Crooked Creek is from a quarter to one and a half miles in width. Also along Lost Creek is a small amount of bottom land subject to overflow.

In all, from Carlyle to the mouth of the Kaskaskia and including the tributary streams, there are approximately 71,800 acres of land which are practically useless.

Shoal Creek is the largest tributary and drains most of Montgomery, Bond, and part of Clinton counties. At the extreme upper end of its watershed, six districts have been formed, the largest of which has 3,720 acres, and their combined area is 10,000 acres. All are providing satisfactory drainage to the land.

The Blue Grass District, 3,480 acres, is now being organized about six miles north of Hillsboro. The topography of Montgomery County is such

that little artificial drainage is required. Considerable damage occurs to the crops raised in the Shoal Creek valley. There are approximately 8,400 acres between Litchfield and Hillsboro and the mouth of Dry Fork. The landowners are not very much concerned about the situation and there is little likelihood of any work being done in the immediate future.

However through the two southern townships in Bond County the landowners are determined to prevent the flooding of their land if possible, and the upper Shoal Creek District has just been organized and commissioners appointed. The proposed plans consist entirely of stream straightening.

Directly south of the above district, the landowners in Clinton County are proposing to form the Lower Shoal Creek District for continuing the work of channel correction. There is not as much enthusiasm shown here and organization is proceeding more slowly. The lower district begins at the Bond-Clinton County line and extends to about three miles south of Breese.

Both of these projects should prove successful owing to the large fall available and to the sandy nature of the soil. It is expected that the channel correction will eliminate all but the extreme floods which occur on an average of once in ten years. The estimated cost of the upper project is \$25 an acre.

Along the East Fork of Shoal Creek for about 15 miles above its mouth, the valley overflows for a width of over one-quarter mile. It is estimated that there are 4,500 acres in this strip.

South of Old Ripley Post Office lies a tract of some 1,500 acres which needs drainage. Petitions have been started here several times, but nothing definite has resulted.

Silver Creek is an important tributary of the Kaskaskia. It has its source in Macoupin County and flows southward through Madison and St. Clair counties and empties into the river at New Athens.

In the northeast corner of Madison County, the New Douglas District No. 1 is being organized to drain 1,480 acres of level land on the divide between Silver and Shoal Creeks.

The Silver Creek District, situated about seven miles east of Edwardsville and containing 1,100 acres is the only organized tract in that portion of Madison County within the Kaskaskia watershed.

In St. Clair County the overflow along this creek is more serious, and in 1912 the creek through O'Fallon Township was dredged by the Silver Creek District No. 1. There are 4,190 acres benefited by this improvement and the assessment was \$22.25 an acre. The land was worth \$15 an acre in 1912, while its present value is about \$70. Some overflow was reported along Ogles Creek which enters the north end of the district.

Silver Creek District No. 2 is now being formed just below to continue the improvement for another seven miles. Approximately 6,520 acres are proposed for this district, but it should contain two or three times as much. On the east from Lebanon to beyond Mascoutah there are about 10,000 acres

which need draining very badly. A petition is now being circulated in this area, but is meeting with strong opposition, an organization having been formed to fight it. There is no question but that the land is worth reclaiming, and that it can be easily and economically done, but it is being opposed on the ground that the land is too poor, and that it is just a scheme for the lawyers and engineers to make money.

Also on the west there is a similar tract which extends almost to Belleville and contains about 7,500 acres. Southeast of Mascoutah is another wet tract covering about 5,000 acres.

In the twelve miles below Belleville along Richland Creek, four districts have been formed for straightening the channel, and a fifth, the North Richland Creek District, 200 acres, is now being organized just outside of Belleville. The four districts are named Richland Creek Nos. 1, 2, 3, and 4 and contain 2,710, 2,150, 1,900, and 700 acres, respectively. These are all successful.

Below District No. 4, the creek is subject to backwater from the river and its reclamation is dependent upon that of the Kaskaskia bottoms.

East of Redbud in Randolph County, 400 acres along a tributary of Horse Creek are organized in the Horse Prairie District.

West of Marissa in St. Clair County, there is a tract of some 10,000 acres of wet land which would be greatly improved by drainage.

A summation of the drainage status in the Kaskaskia watershed, is as follows:

1. Organized districts to the number of 120 and containing a total of 419,640 acres have been formed. This area represents 11.6 per cent of the entire watershed.

2. There are 11 districts now in various stages of formation with a combined area of 103,070 acres, which is 2.8 per cent of the watershed area. Of this area 36,550 acres are now contained in the eight organized districts in Fayette County which are part of the new outlet district.

3. There are 137,800 acres of overflow land in the river and creek bottoms for which no provision has been or is being made.

4. Upland areas needing drainage to the extent of 41,500 acres are shown on the accompanying map. This is only a partial list as this phase of the investigation is incomplete.

5. Of the total area originally in need of drainage, 181,300 acres, or 27 per cent remain.

In conclusion it may be said that the upland areas, especially at the upper end of the watershed, have been well taken care of, and that the reclamation problem is confined mainly to the immediate valley of the river. The future depends largely upon the success of the Okaw Valley Outlet District. If successful, the landowners below Carlyle will undoubtedly continue the improvement in self defense though they may be averse to doing so. If the

district fails to organize, after seven years of hard work on the part of its promoters, the land will remain in its present almost useless condition until such a time as the large majority of the owners are sufficiently informed as to the economic benefits of reclamation to realize the loss they are sustaining yearly by reason of their present nearsighted policy.

CHAPTER XXII—SOUTH FORK OF THE SANGAMON RIVER WATERSHED.

The watershed of South Fork of the Sangamon River covers 1,130 square miles lying in Macon, Shelby, Christian, Montgomery, Macoupin, and Sangamon counties.

The river rises in the southwestern corner of Christian County and flows in a northwesterly direction to its junction with Sangamon River south of Riverton.

The principal tributaries are Flat Branch, Bear Creek, Horse Creek, and Sugar Creek.

Along the river and its tributaries are approximately 24,900 acres of land subject to more or less serious overflow. The width of overflow varies from a quarter to one mile in width as shown on the accompanying map. Nothing has been done toward reclaiming any of this land. Due to the large amount of artificial drainage of the upland prairie land, conditions in the bottom land are worse than they formerly were. Very little is cultivated and the water stands in the bottoms from one to two weeks at a time several times a year. The high ground is well marked, the terrace lands rising abruptly to a height of 40 feet or more. The river channel is very crooked. Its immediate channel is rather deep but is filled with willows and fallen trees. The soil is extremely fertile and the land is well worth reclaiming. East of Taylorville an area of 900 acres has been protected from overflow by a privately constructed levee which cost about \$27,000. The channel was

TABLE 23.—*Drainage data for the South Fork of Sangamon River watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Union No. 1, Milan and South Macon.....	Macon	1,305
2	Flat Branch No. 2.....	Shelby	15,300
3	Prairietown Mutual No. 4.....	Christian	440
4	Union No. 4, Assumption and Flat Branch.....	Christian-Shelby	1,075
5	Union No. 1, Flat Branch and Assumption.....	Shelby-Christian	2,520
6	Flat Branch Mutual No. 1.....	Shelby	1,300
7	Rural No. 1.....	Shelby	680
8	Assumption No. 5.....	Christian	680
9	Union No. 2, Assumption and Rural.....	Christian-Shelby	1,080
10	Assumption No. 4.....	Christian	550
11	Rural Mutual No. 1.....	Shelby	680
12	Union No. 1, Pana and Assumption (Lake Fork)...	Christian	12,320
13	Pana No. 1 ^a	Christian	.....
14	Rosamond No. 4.....	Christian	600
15	Rosamond No. 2.....	Christian	1,280

^aInside Union No. 1, Pana Assumption.

TABLE 23.—*Drainage data for the South Fork of Sangamon River watershed—Continued*

Reference No.	Name of district	County	Area
			<i>Acres</i>
16	Rosamond No. 1.....	Christian	400
17	Union No. 1, Rosamond and Greenwood.....	Christian	830
18	Rosamond No. 3.....	Christian	1,040
19	Union No. 3, Pana and Assumption (Big George)...	Christia	7,480
20	Mutual, Locust, Pana and Assumption.....	Christian	2,040
21	Assumption No. 1.....	Christian	1,520
22	Assumption No. 3.....	Christian	3,040
23	Assumption No. 6.....	Christian	1,160
24	Assumption No. 2.....	Christian	860
25	Union No. 1, Locust and May.....	Christian	3,600
26	Union No. 2, May and Locust.....	Christian	2,040
27	Union No. 3, May and Locust.....	Christian	1,355
28	Union No. 1, Assumption and May.....	Christian	1,450
29	Assumption No. 7.....	Christian	1,610
30	Union No. 5, Assumption and Prairietown.....	Christian	1,520
31	Mutual No. 1, Prairietown (Peabody).....	Christian	390
32	Prairietown No. 1.....	Christian	660
33	Mutual No. 2, Prairietown.....	Christian	390
34	Union No. 1, Prairietown and Pleasant View.....	Christian-Macon	1,680
35	Stonington No. 4.....	Christian	2,500
36	Stonington No. 1.....	Christian	1,420
37	Stonington Mutual No. 2.....	Christian	1,210
38	Clear Creek Special.....	Christian	4,040
39	Union No. 1, May and Taylorville.....	Christian	2,210
40	Taylorville No. 1.....	Christian	1,760
41	Taylorville Mutual No. 1.....	Christian	1,040
42	Taylorville No. 2.....	Christian	1,220
43	Taylorville Mutual No. 2.....	Christian	840
44	Hay-Heddin Mutual No. 1.....	Christian	1,300
45	Buckhart Mutual No. 1.....	Christian	460
46	Buckhart No. 1.....	Christian	1,880
47	Buckhart No. 2.....	Christian	1,220
48	Vanderveer (Private).....	Christian	1,760
49	Greenwood Mutual No. 1.....	Christian	720
50	Glover Special.....	Christian-Montgomery	1,920
51	Ricks No. 1 (Hog Lake).....	Christian	3,505
52	Union No. 3, Ricks and Rountree.....	Christian-Montg mery	920
53	Union No. 4, Ricks and Rountree.....	Christian-Montgomery	1,430
54	Union No. 1, Ricks and Rountree.....	Christian-Montgomery	620
55	Union No. 2, Ricks and Rountree.....	Christian-Montgomery	915
56	Bug River Special.....	Christian-Montgomery	5,835
57	King No. 1.....	Christian	1,040
58	Union No. 1, King and Ricks.....	Christian	1,500
59	Union No. 2, King and Ricks.....	Christian-Montgomery	4,790
60	Union No. 1, King and Harvel.....	Christian-Montgomery	1,400
61	Harvel No. 1 (Lone Elm).....	Montgomery	755
62	Union No. 3, King and Harvel.....	Christian-Montgomery	2,965
63	Union No. 1, Bois D'Arc and Harvel (Horse Creek).....	Montgomery	2,975
64	Union No. 2, King and Bois D'Arc.....	Christian-Montgomery	2,660
65	Union No. 1, King and Bois D'Arc.....	Christian-Montgomery	3,750
66	Lloyd-Lemon Mutual.....	Christian	750
67	Union No. 1, King and Bear Creek.....	Christian	1,240
68	Southfork No. 1.....	Christian	2,400
69	Southfork No. 3.....	Christi n	1,480
70	Southfork No. 2.....	Christian	1,600
71	West Clear Creek Special.....	Christian-Montgomery Sangamon	4,730

TABLE 23.—*Drainage data for the South Fork of Sangamon River watershed—Concluded*

Refer- ence No.	Name of district	County	Area
			<i>Acres</i>
72	Union No. 3, King and Bois D'Arc.....	Christian-Montgomery	1,050
73	Bois D'Arc Mutual No. 1 (Dunlap).....	Montgomery	340
74	Bois D'Arc No. 2.....	Montgomery	860
75	Bois D'Arc No. 3.....	Montgomery	1,600
76	Bois D'Arc No. 1.....	Montgomery	1,450
77	Union No. 1, Bois D'Arc and Girard.....	Montgomery- Macoupin	2,280
78	Pawnee No. 1.....	Sangamon	850
79	Divernon No. 1.....	Sangamon	1,645
80	Union No. 1, Bois D'Arc and Divernon.....	Montgomery- Sangamon	660
81	Union No. 1, Virden and Auburn.....	Sangamon-Macoupin	35
82	Talkington Mutual No. 1.....	Sangamon	640
	Total.....		157,645
<i>Districts being organized</i>			
83	Flat Hollow Special.....	Shelby	15,700
84	Buckhart No. 3.....	Christian	1,400
85	King No. 2.....	Christian	1,760
86	Divernon No. 2 (By User).....	Sangamon	640
	Total.....		19,500
<i>Overflowed areas</i>			
87	Along Lick Creek.....	Sangamon	5,100
88	Along South Fork of Sangamon and Tributaries....	Christian-Sangamon	19,800
	Total.....		24,900
<i>Upland areas needing drainage</i>			
89	Northeast of Morrisonville.....	Christian	12,000

straightened for a distance of about three miles and the material all deposited on one side to form the levee. The land is raising abundant crops, where formerly it was practically useless.

Northeast of Taylorville 16 districts have been organized for draining the upland area. The combined area of these districts is 24,475 acres. The largest contains 4,040 acres and most of them between 1,000 and 1,500 acres. Several of them are mutual districts and all were organized under the Farm Drainage Act. A new district, Buckhart No. 3, is now being formed and contains 1,400 acres.

At the upper end of Flat Branch in Shelby County, 15,300 acres were organized into Flat Branch District No. 2. All that was done here was a small amount of dredging along Flat Branch, which gave very little benefit to the land. It was reported that this area was organized to prevent the organization of one or more smaller districts with more comprehensive drainage improvements in view.

To the south of this tract, the Flat Hollow Special District proposes to give drainage to 15,700 acres in Shelby County.

The eastern portion of Christian County is entirely covered with drainage districts to the number of 32, and their combined acreage is 54,200 acres. The largest of these is the Union No. 1 of Pana and Assumption townships which drains 12,320 acres. The next largest is the Union No. 3 of the same township which embraces 7,480 acres. The majority, however, are small districts with between 1,000 and 1,500 acres, though there are eleven with less than 1,000 acres.

There is a third large group along the Christian-Montgomery County line. There are 32 districts here, with a total area of 60,550 acres. The largest district in this group is the Bug River Special with 5,835 acres. One new district, King Township No. 2, is now organizing to drain 1,760 acres. And to the northwest in Sangamon County 640 acres are being incorporated into the Divernon District No. 2. The later is a User District.

Table 23 gives the drainage data for this watershed from which it is seen that there are in all 82 organized districts representing 157,645 acres or 21.7 per cent of the watershed area. Also there are four new districts, proposing to give better drainage to 19,500 acres, which represents 2.7 per cent of the watershed area.

Northeast of Morrisonville is a tract of some 12,000 acres which needs better drainage and which will undoubtedly be incorporated into districts in the near future.

While there are an unusually large number of districts in this watershed, they are nearly all small ones, and present quite a contrast to those in Piatt, Champaign and Douglas counties where drainage has been planned on a more comprehensive scale.

A large number of the districts are tile districts, and many which originally had small open ditches are substituting large tile for them, with shallow overflow channel over them. The result has been that the water does not run off as readily as before and the loss of occasional crops is experienced. In June, 1919, a large part of this upland area was flooded for over a week.

In the western part of the watershed, no organized drainage has been needed. A large amount of private tiling work has been done and the land is well drained.

The drainage of the uplands has been very satisfactory for the most part. Land which was worth from \$60 to \$125 an acre is now valued at

from \$250 to \$300; part of this, however, is due to the natural increase in the price of all farm lands.

With the exception of the wet area northeast of Morrisonville all the large upland areas have been drained and future drainage here must be in small scattered areas.

The big problem remaining is the bottom land. Here, as in similar valleys, heretofore discussed, the solution consists mainly in channel improvement. The valley as a whole is too narrow to levee, hence more attention can be profitably given to the channel than is the case in the wider valleys where levees must supplement channel correction. Any improvement undertaken here should take into consideration the entire valley. This means an outlet district embracing all the bottom lands.

By careful study it will be possible to reclaim a large portion of the bottom lands in this watershed.

CHAPTER XXIII—MACOUPIN CREEK WATERSHED

The Macoupin Creek watershed contains approximately 970 square miles and covers portions of Montgomery, Macoupin, Greene, and Jersey counties.

The creek has its source in the northwest corner of Montgomery County and flows in a southwesterly direction to a point about six miles southwest of Carlinville, and thence in a general westerly direction to the Illinois River near Titus.

Its principal tributary is Otter Creek which drains the northern half of Macoupin County.

There are approximately 40,000 acres in the bottoms along Macoupin and Otter creeks, of which about 25,000 acres have been or are being improved. The flood plains of these creeks are from a quarter to half a mile in width and are subject to frequent overflow. Between January and June, 1920, Macoupin Creek was out of its banks ten times. All the land-owners consulted agreed that during the last ten years, the bottom has not yielded an average of 20 per cent of a crop. One landowner in 1920 was able to harvest only 300 bushels of wheat from 300 acres. The statement was made by one thoroughly familiar with the conditions that the crop loss in 1919 due to overflow was at least \$75,000. The land can scarcely be sold at \$40 to \$50 an acre, though the soil is much better than that of the adjoining upland which brings \$200 an acre.

In all only 19 drainage districts have been organized in this watershed with a combined area of 31,470 acres. The name and size of each of these is given in Table 24, and their locations are shown on the map.

It will be observed that seven of the districts are grouped in the extreme eastern portion of the watershed, and abut a still larger group in the South Fork watershed. The land here is very flat and organized drainage was a necessity. They are all operating quite satisfactorily.

Ten small districts are scattered through Macoupin County containing a total of 11,120 acres.

The largest district in the watershed is the Union No. 1 of Ruyle and Chesterfield with 5,500 acres in the Macoupin Creek bottoms. The work of this district consisted of channel improvement. Joining this area on the east is the Macoupin Creek District which has about completed its organization. Its average width is less than one mile and its length is about nine miles. It is also a stream straightening project.

The Panhandle District is located in the north central portion of Jersey County, and contains 2,165 acres. It is entirely south of Macoupin Creek and no changes were made in the channel. The district has a main ditch through the center of its area.

Beginning at Taylor Creek and extending to the Illinois River bottom,

TABLE 24.—*Drainage data for the Macoupin Creek watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Irish Flats Special.....	Montgomery	4,400
2	Union No. 1, Pitman and Bois D'Arc.....	Montgomery	1,020
3	Pitman No. 4.....	Montgomery	870
4	Pitman No. 6.....	Montgomery	490
5	Pitman No. 2.....	Montgomery	4,460
6	Pitman No. 1.....	Montgomery	715
7	Pitman No. 5.....	Montgomery	725
8	John Ball Mutual Special.....	Montgomery- Macoupin	385
9	Union No. 1, Girard and Virden.....	Macoupin	2,240
10	North Palmyra No. 1.....	Macoupin	900
11	South Otter No. 1.....	Macoupin	1,500
12	South Otter No. 2.....	Macoupin	1,700
13	Honey Point No. 4.....	Macoupin	600
14	Corn Nail Union, Honey Point.....	Macoupin	500
15	Honey Point No. 5.....	Macoupin	1,600
16	Hudelleson-Meiners.....	Macoupin	700
17	Gillespie No. 1.....	Macoupin	1,000
18	Union No. 1, Ruyle and Chesterfield.....	Macoupin-Jersey	5,500
19	Panhandle.....	Jersey	2,165
	Total.....		31,470
<i>Districts being organized</i>			
20	Barnett Special.....	Montgomery- Macoupin	1,240
21	Macoupin Creek.....	Macoupin	4,500
22	Macoupin Creek.....	Greene-Jersey	14,370
	Total.....		20,110
<i>Overflowed areas</i>			
23	Along Macoupin Creek.....	Macoupin	4,000
24	Along Otter, Joes and Macoupin Creeks.....	Macoupin-Greene- Jersey	9,300
	Total.....		13,300

all the low land is being organized into the Macoupin Creek Drainage District. Commissioners have been appointed and contracts for the construction work will in all probability be let during the summer of 1921. According to the plans, the length of the new channel is 50 per cent less than the present one. The district varies from one to two miles in width and contains 14,370 acres. The estimated cost is about \$40 an acre.

With the two new districts completed, all of Macoupin Creek west of Carlinville will have been straightened, with the exception of a five-mile stretch in the northeast corner of Jersey County.

Above Carlinville the valley becomes narrower, but there are about 4,000 acres which are damaged sufficiently by flooding to warrant an improvement in the channel. However, the opening up of the channel below by the new districts will be of considerable value to this upper portion of the stream.

Along Otter Creek and its tributaries and Macoupin Creek between the Panhandle and the Union districts, there are 9,300 acres, approximately, which are subject to overflow.

The topography in the western portion of the watershed is rolling in character and possesses good natural drainage and there is little likelihood of any districts being organized. The eastern portion is flatter but there are no large areas that need combined drainage. The districts which have already been formed here are small and any future districts will likewise cover only small areas. One such district, the Barnett Special, is now organizing along the Macoupin-Montgomery County line. It will contain 1,240 acres.

Drainage development in this watershed is very encouraging, since the work now planned is about 65 per cent as large as all the work which has been done in the past.

Of the 65,000 acres, approximately, originally in need of drainage, about 14,000 acres or 21 per cent remain unreclaimed.

CHAPTER XXIV—LITTLE WABASH WATERSHED

The Little Wabash watershed covers a territory of 2,180 square miles lying in Coles, Cumberland, Shelby, Effingham, Jasper, Clay, Richland, Wayne, Edwards, and White counties.

The Little Wabash River has its source in Coles County and flows southward, with many turns and twists, to Louisville in Clay County, thence southeasterly to the mouth of the Fox River, and then again southerly to its outlet in the Wabash River in Gallatin County.

Its principal tributaries—aside from the Skillet Fork River, which is treated separately in this report—are Elm Creek, Fox River, Muddy Creek, and Salt Creek.

The Little Wabash valley has been subject to frequent overflows as far back as any record exists or the recollection of the oldest inhabitant extends. The most serious floods occurred in 1875, 1876, 1897, 1898, 1904, 1905, 1906, 1913, and 1915. The greatest of these was the March, 1898, flood which covered all the bottoms to a depth of from five to nine feet.

The valley varies from one to five miles in width and contains approximately 137,600 acres subject to overflow, inclusive of bottom lands along tributaries. Of this amount some 42,000 acres is in districts, but since they have no levees the land is still largely subject to overflow.

The soil is very fertile and that in Clay County is classified in the soil report of the Agricultural Experiment Station of the University of Illinois as deep gray silt loam and mixed sandy loam. The report states that this is the most valuable important soil type in Clay County.

Table 25 gives the drainage data for this watershed, from which it is seen that 34 districts with a combined area of 90,070 acres have been organized and that three districts with a total of 7,160 acres are now being formed.

About one-half of the districts are situated in the prairie area at the upper end of the watershed, while the other half are in the river and creek bottoms.

Coles County has nine districts in this watershed with an aggregate area of 13,600 acres. The topography here is slightly rolling and is typical of the corn belt area. The streams are shallow and rather sluggish. The upper prairie has been well developed as regards drainage. Most of the districts are old and have given satisfaction. It is the general opinion that this territory has all the drainage that it needs.

In Cumberland County, 6,020 acres are distributed among six districts, all of which have afforded satisfactory results with the possible exception of District No. 1, Neoga township, which is now involved in some litigation. The commissioners report that the district has not accomplished its purpose, but nevertheless the value of the land is about the same as that in neighboring districts. Formerly these lands brought from \$50 to \$80 an acre, while

TABLE 25.—*Drainage data for the Little Wabash watershed*

Reference No.	Name of district	County	Area
			<i>Acres</i>
1	Union No. 1, Mattoon and Whitley.....	Coles	2,100
2	Bell.....	Coles	540
3	Majors.....	Coles	1,260
4	Little Wabash.....	Coles	2,780
5	District No. 1, Mattoon ^a	Coles	940
6	Ash Grove No. 2 (By User).....	Shelby	1,720
7	Paradise No. 3.....	Coles	650
8	Gannaway, Ellis, Law, Jones Mutual.....	Coles	200
9	Paradise No. 2.....	Coles	280
10	Paradise No. 1.....	Coles-Cumberland	4,840
11	Neoga, No. 3.....	Cumberland	770
12	Ash Grove No. 1 (User).....	Shelby	1,480
13	Neoga Village.....	Cumberland	1,100
14	Neoga No. 2.....	Cumberland	200
15	Neoga No. 1.....	Cumberland	1,830
16	Neoga No. 10.....	Cumberland	1,380
17	Union No. 1, Neoga and Spring Point.....	Shelby-Cumberland	720
18	St. Francis.....	Effingham	750
19	North Muddy.....	Jasper	1,200
20	Little Wabash and Big Muddy.....	Clay	7,500
21	West Decker.....	Richland	1,580
22	Moutray Slough.....	Wayne	2,400
23	Union No. 1.....	Wayne-Edwards	12,000
24	Elm River.....	Wayne	1,400
25	Borah.....	Wayne	10,700
26	Golden Gate.....	Wayne	3,560
27	Union No. 1, Leech and Massilon.....	Wayne	4,500
28	Leech and Grover.....	Wayne	4,530
29	Woods.....	Wayne-White	6,000
30	Randolph No. 1.....	White	4,280
31	Partridge No. 1.....	White	2,000
32	Hawthorne Mutual No. 3.....	White	1,260
33	Emma No. 4.....	White	2,240
34	Emma No. 5.....	White	1,380
	Total.....		90,070

Districts being organized

35	Strassburg.....	Shelby	960
36	Massilon.....	Wayne	2,200
37	Big Creek.....	Edwards	4,000
	Total.....		7,160

Overflowed area

38	Along Little Wabash.....	Shelby-Effingham- Clay	54,920
39	Along Big Muddy Creek.....	Clay-Richland	5,000
40	Along Little Wabash River.....	Clay-Richland-Wayne	3,500

^aOutside of other districts.

TABLE 25.—*Drainage data for the Little Wabash watershed—Concluded*

Reference No.	Name of district	County	Area
41	Along Fox River.....	Richland-Edwards	10,100
42	Area north of Elm River District.....	Wayne	1,500
43	Along Little Wabash East of Union No. 2.....	Edwards	4,000
44	Along Village Creek.....	Edwards	1,300
45	Along Little Wabash.....	Wayne-Edwards- White	15,000
46	Along Little Wabash North of Carmi.....	White	1,000
	Total.....		96,320

Uplands areas meeting drainage

47	North of Shumway.....	Effingham	1,260
48	South of Welton.....	Effingham	1,802
49	Southwest of Montrose.....	Effingham	1,800
50	Southeast of Montrose.....	Effingham-Jasper	2,400
51	North of Dieterich.....	Effingham-Jasper	2,000
52	Southeast of Wheeler.....	Jasper	1,500
53	South of Dieterich.....	Effingham-Jasper	2,510
54	Northeast of Winterrowd.....	Effingham	1,000
55	West of Latona.....	Effingham-Jasper	3,500
56	Around Winterrowd.....	Effingham	3,500
	Total.....		21,290

now they are valued at from \$125 to \$200 an acre. Throughout this county there are small scattered areas of 100 acres or so in extent which needs better drainage. These are not shown on the map, since they can be taken care of by individual effort.

The eastern tier of townships in Shelby County lies within this watershed. Two districts, Ash Grove No. 1 and No. 2 are situated here. The former contains 1,720 acres and the latter 1,480 acres and both are User districts. The Strassburg District is now organizing 960 acres in this area. The overflow along the river in this county averages a good half mile in width.

Nearly all of Effingham County is in the Little Wabash watershed. The St. Francis District, 750 acres, has just been organized and is now in the classification stage. There are two other areas considering organization, which have apparently been awaiting the outcome of the St. Francis District. In all probability they will be organized soon. They are shown in green on the map. The big drainage problem in this county is the prevention of overflow along the Little Wabash and main tributaries. The bottom lands are rich and raise good crops whenever the river permits; but on the average only about one out of four or five crops is harvested. Only short season crops can be raised with any degree of safety. The floods rise rapidly

and last from two to ten days. The tributary creeks have about the same characteristics except that they are subject to backwater from the river. The county farm adviser is doing much toward creating a favorable drainage sentiment. He has prepared a map of the county showing the wet lands which should be organized into districts. Any plan for the improvement of the river below should not fail to take into account the 40,000 acres in Effingham County which will undoubtedly be organized eventually into districts which will result in a much greater run-off.

Jasper County has only one district in this watershed. This is the North Muddy, 1,200 acres, which is just completed. Drainage sentiment in this locality seems evenly divided. Several wet areas are shown on the map which are feasible drainage projects. There is also a small amount of overflow along the creeks in the southwest corner of the county.

Clay County has done no upland drainage. The bottom land at the mouth of Muddy Creek was organized in 1911 into the Little Wabash and Big Muddy District. It has no levees and its 7,500 acres are overflowed every year. The present value of the land is about \$50 an acre which is an indication that the project has not been a success. The sentiment in this community is that all the bottom land in Clay, Richland, Wayne, and White counties should form an outlet district for straightening the river; but there does not seem to be any one sufficiently interested to give the necessary time to the formation of such a district.

In 1907 a coöperative agreement was made between the State Geological Survey, the Internal Improvement Commission of Illinois, the U. S. Geological Survey, and the Drainage Investigations Divisions of the U. S. Department of Agriculture for a study of the overflow situation along the Little Wabash and Skillet Fork. Surveys were made in 1907-08 from the mouth of the stream to Louisville in Clay County, and plans for the protection of the overflowed lands were published in 1911 by the Rivers and Lakes Commission. This report gives the flooded area along the Little Wabash as 70,400 acres. Since the survey stopped at Louisville this total does not include the overflow above that point. Above Louisville the valley will average one and a half miles in width to the north line of Effingham County.

The General Assembly in 1917 passed an act providing for the organization of the Little Wabash drainage district, and under this act a petition for the formation of such a district to include all the overflowed area south of the Clay-Wayne County line was presented to the Wayne County Court. The petition was denied and later the 1917 act was declared unconstitutional and was repealed by the 1919 legislature. However, a special act of the legislature is not necessary since it is possible to form an outlet district under the provisions of Section 65a of the drainage laws, and the landowners along the Skillet Fork are now organizing such a district. It is to be hoped that the Little Wabash Valley will follow their example.

The West Decker District which is located in the southwestern corner of Richland County was organized in 1910. It has not been successful and the value of the land has increased only about \$15 an acre due to the improvement. There are about 10,100 acres of overflowed land along Fox River which flows north and south through the center of this county and empties into the Little Wabash near the village of Blood in Edwards County. The width of overflow here is sufficient to warrant a district for the purpose of channel improvement.

Nearly all of the bottom land in Wayne County is in organized districts. As none of them has levees, they are subject to overflow and consequently are only partially successful.

The Union District No. 1 of Wayne and Edwards counties was organized in 1908 and has constructed 28 miles of ditches. The land is overflowed two or three times a year and its value has increased very little. There has been a number of sales recently at from \$20 to \$40 an acre. The commissioners are planning to levee the district, convert one of the existing ditches into a diversion channel for the hill waters, and install a pumping plant. The area in this district is the same as that shown in Levee District No. 5 of the Rivers and Lakes Commission's report. In planning their levee system the commissioners and engineers have received the cooperation of the Drainage Investigations Department at Washington. When completed this will be the only district in Wayne or White counties which will be satisfactorily reclaimed. It should serve as an example to the other districts. But it would be detrimental to this valley to have many levees built before the stream itself is straightened.

Just south of the Union District and north of Village Creek, an area of 2,200 acres is being organized into the Massilon District. No levees are contemplated and hence complete reclamation will not be obtained.

The Elm River District was organized in 1909. It has accomplished some good but the main ditch is too small and does not adequately serve all the lands in the district. It is overflowed more or less every year. The market value of the land is about \$40 an acre. Above this district there is a strip of 1,500 acres which should be included.

The Borah District has the unique distinction of never having completed its organization. There were objections to the assessment roll and it has never been approved by the court. Nevertheless the commissioners have gone ahead and constructed 23 miles of ditches and are now trying to collect assessments from the objectors on the grounds that they accepted payment for the right of way through their lands and are receiving benefits from the improvement. Part of this district is overflowed every year by back water from the Little Wabash. About 45 per cent of the area is not satisfactorily drained.

The Leech and Grover District, organized in 1905, has constructed

seven miles of ditches. The upper end is satisfactorily drained but the lower end is overflowed at certain seasons. The commissioners report that the district should be enlarged by annexing lands at both ends. Before the district was organized the land sold for \$10 an acre; now it brings from \$25 to \$100. Sentiment is strong in this community for State aid in straightening the Little Wabash.

The Golden Gate, Leech and Massilon, and Woods districts are quite similar to those above mentioned. All of them lack satisfactory outlets and should combine with other districts for improving the channel.

The Randolph District in White County which was organized in 1907 is considered very successful. It has seven miles of ditches and ten miles of large tile. All the land in the district can be used. The value of the land has increased from about \$85 an acre to from \$150 to \$200.

The Partridge District has been in operation since 1910. The land is valued at from \$125 to \$150 an acre, though it is subject to some overflow. The 400 acres in Bumble Bee bend should be annexed according to the commissioners.

Directly south of the above area lies Hawthorne District No. 3 which was organized many years ago under the Farm Drainage Act. Its ditches have become silted up and need cleaning out badly.

Two of the Emma Township districts are in this watershed. So far as could be determined, they have been satisfactory.

Along Big Creek in Edwards County, a district of some 4,000 acres is being promoted which should provide successful drainage for this area.

A glance at the accompanying map shows the seriousness of the overflow problem in the Little Wabash valley. The overflowed areas are continuous from the center of Shelby County through Effingham, Clay, Richland, Wayne, and Edwards counties to the middle of White County. A number of its larger tributaries are also subject to overflow. A total of 96,320 acres, approximately, are thus affected, exclusive of the area in organized districts which have no protection from overflow. Such areas aggregate at least 20,000 acres, which gives a total of about 115,000 acres in this watershed which are subject to overflow.

The reclamation of this area of rich bottom land is a big problem which should be studied as a unit. The most difficult part of the problem is not that of financing the construction of the necessary drainage works, but of perfecting an organization over such a large area under the petition method required by the drainage law, and of making the preliminary engineering studies which are necessary before intelligent plans of reclamation can be made.

It is legally possible to organize the entire valley into an outlet district, but to do so will require strong leadership, inexhaustible patience and a lot of

hard work. Most of the landowners are willing to pay their part of the cost, but shrink from the difficulties of organization.

As above mentioned, certain preliminary engineering studies should be made of the watershed as a whole, and it would seem that the making of such studies might very properly be a function of the State or Federal Government. It would be a misfortune to attempt to carry out certain phases of reclamation in a haphazard fashion, several groups of individuals working independently and without any regard as to the effect of their plans upon other areas. A comprehensive plan should be prepared for the complete protection of the whole valley, and local reclamation left to the convenience of the landowners; but there should be some authority with power to supervise such local work to insure the carrying out of the original plans in so far as they affect surrounding areas.

The straightening and dredging of the river will not solve the overflow problem as it is impracticable on account of cost to construct a channel large enough to carry the flood waters within its banks; but the minor floods will be eliminated and the flood periods will be considerably shortened. At the upper end of the stream the height of floods would also be less; but in the lower portion it would probably be greater. This is the first step and is well worth the cost if not carried to extreme lengths. The reader is referred to Chapter XXX in this connection.

To entirely reclaim the bottom land in a valley of this size, levees will be required except at the upper end of the watershed. The larger hill streams will also have to be leveed or diverted around the bluffs. In some cases pumping plants will be necessary and will prove good investments.

The land is worth protecting and the landowners are losing money every year they delay the construction of protection works.

CHAPTER XXV—SKILLET FORK WATERSHED

Skillet Fork is the outlet for the drainage from 1,080 square miles. The watershed covers portions of Clay, Marion, Wayne, Jefferson, Hamilton, and White counties. Its length is about 60 miles and its extreme width 25 miles.

The river has its source in the western part of Clay County and flows in a southerly and southeasterly direction to its confluence with Little Wabash River northeast of Carmi. Its course is very crooked, winding from side to side of its flood plain and forming many loops, so that the length of its channel is about two and one-half times the air line distance from source to mouth. The valley varies in width from a quarter of a mile at the upper end to one and a half miles at the lower end, while near Mill Shoals it is about six miles wide.

The valley has been subject to overflow as far back as the oldest settlers can remember. The floods commonly come in the spring months, though occasionally in the summer. It is the latter floods that cause crop losses, and their frequency has caused a number of farmers to give up farming in the bottoms. The highest water in the upper portion of the valley occurred in March, 1907, and in the lower valley in 1904.

The bottom soil is a gray silt loam and contains most of the elements needed for plant growth, but is slightly acid. It is naturally the richest soil in the watershed, and if its overflow could be prevented, would become very valuable.

Table 26 gives the drainage data for this watershed. No drainage has been done above Wayne City. The upland needs drainage, but the soil does not lend itself readily to tile drainage. The surface soil is underlain at a shallow depth by a tight clay subsoil, which prevents the percolation of water with the result that rain water stands on the surface till it evaporates. The land is rarely in good farming condition, since it is usually either too wet or too dry. At the University of Illinois' agricultural experiment farm at Fairfield, in Wayne County, a portion of the land has been tiled, and it has been found that the financial return from the tiled land is very little more than that from the untiled land—in fact, not enough to pay good interest on the investment. As a result of this tiling experiment, the landowners have been told that the land in this neighborhood can not be successfully tile-drained. Since the customary method of tiling is not adapted to the conditions here and since the land suffers from lack of drainage, studies should be made by the scientific bureaus of the State to determine a correct solution of the problem.

The bottom land along the river above Wayne City varies from a quarter of a mile to two miles in width, and contains approximately 14,200 acres.

TABLE 26.—*Drainage data for the Skillet Fork watershed*

Reference No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Big Mound.....	Wayne	9,450
2	Auxier Creek Special.....	Wayne-Hamilton	4,500
3	Haw Creek Special.....	Hamilton-White	30,000
4	Mud Creek No. 4.....	White	1,240
5	Fulkerson No. 1.....	White	920
6	Mill Shoals No. 3.....	White	1,580
7	Lost Creek.....	White	5,000
	Total.....		52,690
<i>Drainage districts being organized</i>			
8	Skillet Fork River Outlet ^a	Wayne-Hamilton- White	40,030
9	Seven Mile.....	White	10,000
	Total.....		50,030
<i>Overflowed areas</i>			
10	Skillet Fork, upper end.....	Marion-Wayne	14,200
11	Along Horse Creek.....	Jefferson-Wayne	5,560
12	Along Dry Fork.....	Wayne	4,500
13	Along Haw Creek.....	Jefferson-Hamilton	7,100
14	Area in Delafield District.....	Hamilton	5,920
15	Beaver Creek Area.....	White	3,000
	Total.....		40,280

^aTotal area in district is 78,680 acres, but 38,650 acres are already in other organized districts.

Along Horse Creek is an additional amount of about 5,560 acres, and along Dry Fork about 4,500 acres.

In 1907 a coöperative agreement was made between the State Geological Survey, the U. S. Geological Survey, the Internal Improvement Commission of Illinois, and the Drainage Investigations Office of the Experiment Station, U. S. Department of Agriculture, for a study of the overflow situation along Little Wabash and Skillet Fork rivers. Surveys were made in 1907-08 by the agency last mentioned above, and plans and recommendations were prepared by them for the reclamation of the overflowed land. These were published in 1911 by the Rivers and Lakes Commission, which succeeded the Internal Improvement Commission. The survey along Skillet Fork extended as far north as the mouth of Dumms Creek which is just above the Baltimore and Ohio Southwestern Railroad in Marion County.

In regard to the portion of the valley above the mouth of Dry Fork, the report makes the following statement:

"The valley varies in width from three miles at Dry Fork to one-half mile at the upper end; the land slopes from one and one-third to one and three-quarters feet per mile, and the high-water grade line is practically parallel to the land surface and from five to seven feet above it. The channel in the lower part of this section, if properly cleared of trees and drift would be large enough to carry the floods. Islands occur in the center of the channel, covered with willows, which materially affect the flow of the water in the channel."

For this portion of the stream, channel improvements and cut-offs, where needed, were recommended. The cost of carrying out the proposed improvement was estimated at \$17.48 per acre for the 14,700 acres subject to overflow between Dry Fork and Brush Creek, and \$5.06 an acre for the 5,000 acres between Brush Creek and Dumms Creek.

South of Wayne City several districts have been formed in the valley. The most northerly of these is the Big Mound Drainage District which contains 9,450 acres in the flood plain. No levees have been constructed and the area is still subject to overflow. The existing ditches enable the land to drain quickly after the flood subsides, but during summer floods crops are lost.

South of the above district, lies a large area of overflowed land which was the bed of an old lake. The Haw Creek Drainage District of 30,000 acres, was organized in this area in 1889, and is the oldest and largest district in the valley. It includes the bottom land along Haw, Lagoon, and Watson's creeks, and extends about eleven miles from the river. The general elevation of this tract is six feet lower than the land surface at the mouth of the river, and consequently considerable difficulty has been experienced in its drainage. Twenty-one miles of ditches have been dredged, which due to unsatisfactory outlet have silted up badly and only about half of the district is adequately drained. The land is overflowed about every other year. The ground slopes away from the banks of the stream and successful drainage is difficult if not impossible till a deeper and larger outlet is provided. A large amount of litigation has resulted due to unsatisfactory conditions. Owing to the dissatisfaction of the owners of the land which was not receiving the desired benefits from the district, the commissioners levied an assessment for dredging a new ditch one and a half miles south of the present outlet ditch. Considerable objection to this plan developed on the part of those who wanted to remedy the situation by improving Skillet Fork so as to provide a better outlet, but the court decided that the new ditches should be constructed.

The Auxier Creek Drainage District, which has its outlet in the Haw Creek District's ditch, has had similar trouble. It was organized in 1914 and contains 4,500 acres. Fifteen miles of ditches represent the work of

this district. According to the commissioners, the value of the land has increased from an original value of \$25 an acre to \$50 as a result of drainage. This indicates that the district has not been entirely successful, else the present value of the land would be greater. The area was partially overflowed in 1916, 1917, and 1918.

For a distance of about nine miles up the creek, the land is in need of better drainage. About 7,100 acres are thus affected.

Two other small districts in Skillet Fork valley, namely, the Mud Creek No. 4 and the Fulkerson No. 1 have 1,240 acres and 920 acres, respectively. Both have been as successful as could be expected under existing conditions.

In the Rivers and Lakes Commission's Report it is recommended that seven levee districts be organized between the mouth of Seven Mile Creek and that of Dry Fork, each one to be independent of the others as far as the protection of its land is concerned. Some channel improvement was also recommended as well as some intercepting ditches along the foot of the hills. The cost of these districts was estimated at from \$6.35 to \$24.30 an acre, with an average cost of about \$11.08 an acre. This estimate does not provide for pumping plants which were suggested for some of the districts. The improvement suggested for the lower stretch of the river consisted of channel cleaning only.

Since the channel correction suggested in the above report could not be carried out under the law at that time, a bill was introduced in the General Assembly in 1917, providing for the formation of the Skillet Fork Drainage District, and was passed. However, when the landowners attempted to organize under this act, it was declared unconstitutional by the court and the petition for the district was denied. The 1919 General Assembly repealed the act of 1917; it also amended the drainage law by adding Section 65a, providing for the organization of outlet drainage districts.

The landowners along Skillet Fork then presented another petition to the Wayne County Court in April, 1920, praying for the organization of the Skillet Fork Outlet Drainage District under the provisions of Section 65a. The court decided in favor of the petitioners, and commissioners were appointed to make the necessary plans and estimates. Their report was approved and the district organized. The assessment roll is now being prepared.

The plan proposed in the petition provided for an entirely new channel beginning at the Southern Railroad bridge near Wayne City, and ending in the present channel in sec. 15, T. 4 S., R. 8 E., a short distance below Beaver Creek. From this point to the mouth of the river the channel was to be cleared of all drift, trees, and other obstructions. The channel was to be constructed in seven straight stretches connected by curves and have a total length of about 20 miles. The bottom width at the upper end was to be 80 feet and at the lower end, 120 feet.

The district contains 78,680 acres of which 38,650 acres are in the organized districts above described.

The successful completion of the Skillet Fork Outlet District will be of considerable benefit not only to the owners of the bottom lands, but also to the several counties in which it is located. While this improvement will not prevent all overflows, it will eliminate the minor ones and will materially reduce the duration of the larger ones. It is the first and most essential step in bottom land reclamation. For complete protection from overflow, the middle section of the valley will in all probability have to be leveed as recommended in the Rivers and Lakes Commission's report.

The two other organized districts in this watershed are not in the immediate river valley. These are the Lost Creek District with 5,000 acres, and the Mill Shoals District No. 3 with 1,580 acres. Both are giving satisfactory results.

The bottom land along Seven Mile Creek is now being formed into a district of that name. There are 10,000 acres in the proposed tract. Although this area was flooded from two to eight feet in May, 1920, some owners are objecting and holding up the organization in court.

At the upper end of Big Creek is an area of 5,920 acres which was contained in the petition of the Delafield District which was denied. A second attempt will undoubtedly be made to organize this area.

Considerable sentiment exists along Beaver Creek for the better drainage of 3,000 acres of low land. Plans have been made, but organization has not been effected.

Other areas which are feasible drainage projects are given in Table 26 and their locations indicated on the map.

A summation of the drainage status in the Skillet Fork watershed is as follows:

1. Seven drainage districts have been organized with a combined area of 52,690 acres, a large part of which is only partially reclaimed.
2. Two districts are now being formed which together contain 88,680 acres, of which 38,650 acres are already in organized districts.
3. For 40,280 acres of overflowed land, representing 30 per cent of the area originally subject to reclamation, no provision has been or is being made.

It is to be hoped that the new outlet district will succeed in carrying out its plans, not only for the direct benefit which will result to the landowners themselves, but also as an example to the other watersheds in this part of the State which have large areas of overflowed lands which would be greatly benefited by similar improvements.

CHAPTER XXVI—BIG MUDDY RIVER WATERSHED

The Big Muddy River watershed contains 2,390 square miles lying in Jefferson, Franklin, Williamson, Washington, Perry, Jackson, and Johnson counties. The area is elliptical in shape with a major axis of about 70 miles and a minor axis of about 50 miles.

Big Muddy River rises in the northwestern part of Jefferson County, flows southward to the mouth of Plum Creek, thence southwesterly to a point about five miles south of Murphysboro, and thence southward to its junction with Mississippi River about 40 miles above Cairo.

Its principal tributaries are Middle Fork, Pond Creek, Little Muddy River, Crab Orchard Creek, Beaucoup Creek, and Kinkaid Creek.

The channels of the river and its tributaries are very crooked and the bottom land is frequently overflowed. The valleys vary from a quarter of a mile to two miles in width and a considerable portion of the area is wet the year round and can not be cultivated. Much of the bottoms is wooded and covered with bush. A small portion is under cultivation, but crops are lost more than half the time. This is a very important coal-producing area and more attention has been given to the development of the coal mines than to the use of the surface for agricultural purposes.

From the standpoint of drainage, the Big Muddy watershed is the most backward watershed in the State. As indicated in Table 27, 138,500 acres are subject to overflow and not a single drainage district has been formed in the entire area. In the upper portion of the watershed, where most of the bottom land is situated, the majority of the owners are adverse to any improvement, and thus far nothing has been done. All of the overflowed land in Jefferson, Franklin, Williamson, and Perry counties could be reclaimed very easily and at a comparatively small cost. The opinion seems to be general that the lower Big Muddy will not provide an adequate outlet for the waters from above. It will require a considerable amount of promotional work to create a favorable drainage sentiment in this valley.

The market value of the bottom land is from \$15 to \$30 an acre; while if free from overflow and drained, it would be worth about \$150 an acre.

In 1908, 1909, and 1910, the bottom land along the Big Muddy as far north as Benton was surveyed and mapped by the U. S. Geological Survey in coöperation with the State Geological Survey and the Internal Improvement Commission of Illinois with the purpose in view of determining the feasibility of constructing a navigable channel from the coal fields to Mississippi River. In 1916, Bulletin No. 19 was issued by the Rivers and Lakes Commission dealing with this project, but no drainage studies have been made in this watershed by any agency.

From Sand Ridge to about the south line of Franklin County, the river

TABLE 27.—*Drainage data for the Big Muddy River watershed*

Reference No.	Name of district	County	Area
<i>Organized districts</i>			
	None.....		<i>Acres</i>
<i>Drainage districts being organized</i>			
1	Crab Orchard.....	Williamson	3,600
<i>Overflowed areas</i>			
2	Beaucoup Creek and Galum Creek.....	Washington-Perry-Jackson	24,700
3	Little Muddy River.....	Perry-Franklin-Jackson	17,700
4	Big Muddy.....	Jefferson-Franklin	56,700
5	Middle Fork and Ewing Creek.....	Franklin	14,400
6	Pond Creek.....	Franklin-Williamson	5,200
7	East and Crab Orchard Creeks.....	Williamson	1,500
8	Big Grassy, Wolf and Crab Orchard Creeks.....	Williamson-Jackson	7,800
9	Cedar Creek.....	Jackson	4,000
10	Big Muddy (lower end).....	Jackson	6,000
11	Kinkaid Creek.....	Jackson	500
	Total.....		138,500

valley is too narrow to warrant a reclamation project. The fall of the stream is less than half a foot to the mile through this portion of the valley, and backwater from the Mississippi frequently extends to Murphysboro.

Along the river in Jefferson and Franklin counties there are 56,700 acres of bottom land, and along Middle Fork, Ewing Creek, and Pond Creek, an additional 19,600 acres. Most of the Pond Creek bottoms are cleared and farmed, but crops are lost about half the time. Drainage sentiment in this locality is good and some improvement should result.

Along Beaucoup Creek and Little Muddy River there are 24,700 and 17,700 acres, respectively, of bottom land. The soil here is a gray clay, and whether or not it would pay to reclaim it is a question, as this type of soil is extremely difficult to farm and possibly should be left as woodland. This phase of the subject should be given proper consideration in any plans which might be made for this area.

The 6,000 acres of overflowed land at the lower end of the Big Muddy valley is considered very poor farm land. It is largely owned by a land speculating company, and some ditches have been dug and a good portion

has been cleared. A number of farmers have bought in this area but have been unable to farm the gray and drab clay soil successfully.

Plans are being proposed for a district of 4,000 acres along Cedar Creek. Channel correction is all that is needed here to give complete protection.

Along the lower end of Kinkaid Creek is a small wet area of 500 acres which needs some attention. However, the area is too small to justify much expense.

In Williamson County, along Crab Orchard Creek, the landowners are trying to organize a district which will reclaim 3,600 acres of probably the best land in the county. The undertaking is entirely feasible from an engineering and economic standpoint, but there are some objectors who are fighting the organization in court. Below this area, 7,800 acres of bottom land along Crab Orchard, Wolf, and Big Grassy creeks are damaged by overflows. There is considerable sentiment near Makanda in favor of straightening the creek which flows through that village.

Of the 138,500 acres listed in Table 27 as subject to overflow, at least 90,000 acres are good farming land and reclamation should prove a very profitable investment to the owners. The value of the remaining acres is doubtful and a further study is necessary to determine whether or not reclamation can be accomplished profitably.

The first step in the reclamation of these areas is the cleaning and straightening of the channels to enable the flood waters to run off faster. This could be done through the formation of outlet drainage districts such as are now being formed along the Kaskaskia, Skillet Fork, Sangamon, and other rivers and creeks throughout the State. The estimated cost of these projects is from \$20 to \$30 an acre.

After the river is straightened, the larger areas should be leveed, and in some cases pumping plants installed for removing the water which collects behind the levees during flood periods.

The opposition to drainage is at bottom due to a lack of information on the part of landowners as to the engineering and economic aspects of the subject. No one is to be censured for objecting to a proposition which he does not understand. If the methods, cost, and benefits of drainage could be clearly explained to these men and examples given of similar areas elsewhere which have been successfully and profitably reclaimed, a large number of the fair-minded men who are now opposed to drainage improvements would change their views. The reclamation of good farming land is the best investment a landowner can make. It is also to the interest of the State to bring these waste lands under cultivation. A little educational work on the part of the State would help considerably in accomplishing this object.

CHAPTER XXVII—SALINE RIVER WATERSHED

The Saline River watershed contains 1,230 square miles situated in Hamilton, White, Saline, Gallatin, Franklin, Williamson, and Hardin counties. It is roughly trapezoidal in shape with the upper base along the Wabash and Ohio rivers.

Saline River is formed by the confluence of South and Middle Forks, about six miles southeast of Harrisburg. It flows eastward to Equality where it receives the waters of North Fork, and thence southeasterly to its outlet into Ohio River. The lower four miles of Saline River form the boundary line between Gallatin and Hardin counties.

The drainage data for this watershed are given in Table 28, from which it is seen that twenty drainage districts with an aggregate area of 125,920 acres have been formed; and that five districts are now in process of organization which will add 31,180 acres to the above total; also that approximately 64,850 acres are overflowed during storm periods. Most of this is along the Wabash and Ohio rivers, and the remainder along the middle and lower portions of Saline River.

At least half of the watershed is drained by North Fork which has its source in Hamilton County, and is the outlet for two large drainage districts. The first of these is the North Fork Special which was organized in 1909, and contains 27,000 acres of bottom land along North Fork and Contrary Creek. Above Broughton the land is drained satisfactorily, but below this point about 5,000 acres are not well drained because of the choked conditions of the river below the district. This condition will be largely overcome by the new Cane Creek and Omaha District which is organizing to the south. Before this district was organized the land brought about \$20 an acre; its present average value is given by the commissioners as \$50 an acre.

South and west of the North Fork District lies the Rector Special, which completed its 20 miles of ditches in 1912. It contains 17,130 acres along Rector Creek and has its outlet in the lower end of the North Fork District. According to the commissioners it has complete protection from flood waters and relief from rainfall, but the valuation of \$50 an acre placed on the land does not seem to warrant this conclusion. This district will probably be benefited by the Cane Creek and Omaha District which is now organizing about 9,200 acres along North Fork, Bear Creek, and Cane Creek. This will include all of the overflowed land along these streams with the exception of about 3,850 acres on the north end of Bear Creek in White County.

Along a tributary of Cane Creek, 5,965 acres are incorporated in the Union District No. 2 of Ridgway and Asbury townships, which is giving

TABLE 28.—*Drainage data for the Saline River watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized districts</i>			
			<i>Acres</i>
1	North Fork Special.....	Hamilton-Saline	27,000
2	Rector Special.....	Hamilton-Saline	17,130
3	Union No. 1, Ridgeway and Asbury.....	Gallatin	890
4	Union No. 2, Ridgeway and Asbury.....	Gallatin	5,965
5	Pond Settlement.....	Gallatin	2,560
6	Cottonwood.....	Gallatin	1,400
7	Rock Branch.....	Gallatin	4,120
8	Cypress Creek.....	Gallatin	11,000
9	Smoky Row.....	Gallatin	980
10	Cottage Grove.....	Saline	3,140
11	Black Branch.....	Saline	2,670
12	Black Land Special.....	Saline	5,570
13	Eldorado.....	Saline	2,175
14	Middle Fork Special.....	Saline	10,980
15	Bankston Special.....	Saline	8,760
16	West Harrisburg.....	Saline	1,720
17	Pankey Branch.....	Saline	3,500
18	Briar Creek.....	Saline	3,720
19	Saline Valley Special.....	Saline	9,740
20	Stonefort.....	Saline	2,900
	Total.....		125,920
<i>Drainage districts being organized</i>			
21	Cane Creek and Omaha.....	Gallatin-White	9,200
22	North Fork.....	Gallatin	1,820
23	Lawler.....	Gallatin	1,880
24	Lower Middle Fork Outlet.....	Saline	10,000
25	South Fork Saline River.....	Williamson	8,280
	Total.....		31,180
<i>Overflowed areas</i>			
26	Along Bear Creek.....	White-Gallatin	3,850
27	Area south of Union No. 2.....	Gallatin	1,000
28	Along Wabash north of Shawneetown.....	Gallatin	30,500
29	Saline and Ohio, south of Shawneetown.....	Gallatin-Hardin	5,700
30	Along Saline, South Fork, North Fork.....	Saline-Gallatin	11,800
31	West of Stonefort.....	Saline	1,000
32	West end of South Fork.....	Williamson	1,000
	Total.....		64,850

satisfactory drainage. Union No. 1 of the same township is a tile district with no open ditches and contains only 890 acres.

Southeast of the No. 2 district is an area of 1,000 acres which needs drainage. The owners of this land tried to organize the Tennessee District, but the court dismissed the petition.

South of the new Cane Creek and Omaha District, the bottoms along the North Fork are overflowed for a width of half a mile or more. A second North Fork District is being promoted south of Elba, containing 1,820 acres along White Oak Creek.

There is still another small district northeast of Ridgeway, namely, the Cottonwood District with 1,400 acres along the creek of that name. It has been in existence a number of years and is operating successfully.

Thus it is seen that most of the bottom land in the North Fork watershed is either in districts or is being organized at the present time. What this area needs is an outlet district to open up the lower end of North Fork and at least a portion of Saline River proper.

Middle Fork of Saline River rises in the hills of eastern Williamson County and the northern part of Saline County and drains the greater part of the latter county, emptying into Saline River about six miles southeast of Harrisburg. Nine districts have been formed in this area and one is now being formed.

Along the upper end of Middle Fork, the Middle Fork Special, comprising 10,980 acres, was completed in 1912. The upper portion is successfully drained, but the lower two miles suffer for lack of a better outlet. The commissioners state that the district does not contain all the land which should be included in it and that the lower end is overflowed by every high water.

Along Bankston Creek to the south, the Bankston Special District was organized in 1910 to provide drainage for 8,760 acres. It has not accomplished its purpose since it is overflowed annually due to the choked condition of its outlet, Middle Fork. The land here is valued at about \$50 an acre. This district also should be enlarged to include some outlying lands.

In the western portion of the city of Harrisburg, about 1,000 acres were organized in 1910 into the West Harrisburg Drainage District. This area is used mostly for building purposes and is seldom damaged by overflows.

South of Harrisburg two districts have been formed, the Pankey Branch containing 3,500 acres and the Briar Creek with 3,720 acres. The former district is a new one and is not completed; the latter was organized in 1910.

South of Eldorado are four districts, three of which have their outlet in Middle Fork. First comes the Eldorado district with 2,175 acres; next, the Black Land Special which was organized in 1905, was the first district along Middle Fork, and contains 5,570 acres, which the commissioners value at \$160 an acre; and lastly is the Black Branch District, which was formed in 1915 and includes 2,570 acres.

The agricultural and industrial development of Saline County is of comparatively recent date. The opening of the coal fields in 1902 to 1905 brought in outside capital which provided the funds for agricultural improvements. The first district, organized in 1905, was followed by a second in 1909, and in 1910 and 1911, by seven more. They are all at the upper end of the Middle Fork watershed or along the creeks which flow into the river, where reclamation could be accomplished with the least expenditure. Each district was constructed independently and with no thought as to the relation of the several undertakings. The result is a serious flooding of the lower portion of the Middle Fork valley. The flood waters carry a large amount of silt and the river channel and the mouth of the ditches have become badly choked.

To remedy the situation, the Lower Middle Fork Outlet Drainage District is now in process of organization. It will embrace about 10,000 acres and will include portions of all of the surrounding districts. The city of Harrisburg which is in this area has a very unsatisfactory outlet for its sewage, and will bear part of the expense of the project. As usual, there are objectors who are opposed either to the enterprise as a whole or to the proposed distribution of the cost, and are fighting the organization. If this district is constructed, the existing districts and the bottom land along Middle Fork will have good outlets and should have no further trouble; but below the mouth of the Middle Fork, the flood conditions will be worse than at present. Between the lower end of the proposed outlet district and the mouth of Saline River approximately 15,000 acres are to be classed as overflowed bottom land.

South Fork rises in the hills of Johnson and Williamson counties, and follows very closely the Ozark uplift which forms the southern divide. The run-off from the hills is so very rapid that the stream cannot handle it within its banks. The result is a flooding of the lowland for a width of from a half to two miles.

Two districts have been organized here and a third is now being formed. The Saline Valley Special includes 9,740 acres between Carriers Mills and Mitchellsville, and was formed in 1913. As the commissioners give its original value as \$25 an acre, and its present value as \$40, the district cannot have bettered conditions very much. The land was overflowed in 1917 and 1919. Lack of an outlet seems to be the main difficulty.

The second district, the Stonefort, is directly upstream. No definite information was obtained as to its success.

In Williamson County along South Fork, a district of that name, containing 8,280 acres, was organized, commissioners appointed, and surveys made; but the assessment has not yet been spread and the objectors are still fighting the district so that it may yet be defeated. About 1,000 acres to the

west should be annexed. Also to the east in Saline County, another 1,000 acres between the new district and the Stonefort, should probably be combined with one of them.

South of Cottage Grove is located a district of that name comprising 3,140 acres. Its outlet is in Saline River east of the mouth of Middle Fork, but it is subject to overflow from both streams and part of its area is included in the new outlet district.

The Cypress Creek Drainage District is northwest of the Shawneetown Hills and contains 11,000 acres. Part of it is flooded in periods of high water, and in 1913 the entire district was inundated. The district crosses the low divide between the Saline and Ohio rivers. According to one of the commissioners, the ditches were improperly located, since some of the landowners refused to permit them to be dredged where they really should have been. Three bad cuts through quicksand cannot be kept clean and as a result the eastern end of the district is not satisfactorily drained. Some of the owners here are trying to withdraw and organize a new district draining to the east.

Since the above district was formed, the Rocky Branch District has been organized to the north and uses lateral No. 2 of the former district as an outlet, which results in the land along this lateral being flooded after every heavy rain. There is considerable friction between the landowners which has been detrimental to the district. The Rocky Branch District is not yet completed.

The Smoky Row District is now under consideration. It is a small district of 980 acres, lying between two ranges of hills just west of Shawneetown, and contains all the wet lands in that locality.

The Lawler Drainage District is in the petition stage. It proposes to reclaim 1,880 acres to the west of the Cypress Creek District.

South and west of Equality approximately 12,000 acres are subject to reclamation. An outlet district is needed here to clean and straighten the channel.

The largest area of overflowed land in this watershed is along Wabash and Ohio rivers. The width of overflow varies from about four miles at the upper end to about one and one-half miles at the lower end. The tract contains 36,000 acres, approximately, and could be very profitably reclaimed. In the northern part of this area, the Pond Settlement District has partially reclaimed 2,560 acres. Levees have been constructed, but are not of sufficient height to entirely protect the district at high stages of the river.

There are approximately 2,500 acres along Eagle Creek in the southern part of Gallatin County, which would make a feasible drainage project. This creek overflows frequently from its own water as well as from back-water from the Saline.

The drainage sentiment in the Saline watershed is good. Of the area originally in need of drainage, 64 per cent is either in districts or is now being formed into districts. The main problem in the area is the straightening and dredging of Saline River, including North, Middle, and South forks, so as to provide a sufficient outlet for the drainage ditches. The feeling among the landowners is that the organization of a district to cover such a large territory is too much of an undertaking for them to attempt and that the State should assist them in providing the necessary outlets.

CHAPTER XXVIII—CACHE RIVER WATERSHED

Cache River is the outlet for the drainage from 720 square miles of territory situated in Union, Johnson, Alexander, Pulaski, Massac, and Pope counties.

The northern boundary of this watershed is formed by a spur of the Ozark mountains. The natural drainage here is good with the exception of some of the stream bottoms which are subject to overflow due to their crooked channels and to insufficient outlets in Cache River. Along the southern boundary of Union and Johnson counties the hills end, forming abrupt bluffs. To the southward for a distance of from three to six miles, the surface is practically level and was originally covered with ponds and sloughs, and was overflowed for a period of from six to eight months of the year. To the south is another range of hills which forms the divide between the Cache and the Ohio rivers. The basin between these two ranges of hills is concave to the south and extends from Bay City on the east to Olive Branch on the west, a distance of approximately 45 miles. No doubt at one time this low area served as a floodway for Ohio River at high stages, the water flowing from east to west across the entire basin. Now however, there is a slight divide between the eastern and western portions of the basin, Bay Creek draining the former and Cache River the latter. The location of this divide has been a matter of controversy between the Cache River and the Bay Bottoms districts, and a decision has only recently been rendered by the Supreme Court which in effect fixes the location as shown on the accompanying map.

Upper Cache River, Cypress Creek, Big Creek, and Mill Creek empty their waters into the basin which collects there as the outlet cannot carry off the water as fast as it enters. Many early attempts were made by groups of individuals to reclaim this area, but with little success. The undertaking was of such magnitude that the landowners felt that they were unable to cope with the problem, and the State was asked to assist. As a result, the General Assembly in 1903 appropriated \$10,000 for the purpose of having the Cache River surveyed and plans and estimates made for "straightening and dredging said river, so as to confine its waters within its banks at all seasons of the year and thereby reclaim said territory for agricultural and sanitary purposes." Three commissioners were appointed by Governor Yates to carry out the provisions of this act, and they immediately had surveys, plans and estimates made. A report was made in 1905, containing recommended plans. However, no immediate action was taken. In 1910 the Cache River Drainage District was organized and its commissioners asked for assistance from the U. S. Department of Agriculture, Office of Drainage Investigations, in making additional surveys and plans. This assistance was given and con-

TABLE 29.—*Drainage data for the Cache River watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
			<i>Acres</i>
1	Cache River.....	Pope-Massac-Pulaski- Johnson-Union	81,000
2	Belknap.....	Johnson	5,900
3	Vienna.....	Johnson	5,500
4	Big Creek No. 2.....	Pulaski-Union	6,500
5	Big Creek No. 1.....	Pulaski-Union	1,420
6	Pulaski.....	Pulaski	5,100
7	Richland.....	Alexander	4,050
8	Cairo.....	Alexander	6,440
9	Mounds Drainage and Levee.....	Pulaski	7,520
	Total.....		123,430
<i>Districts being organized</i>			
10	Upper Cache River.....	Union-Johnson	21,380
11	Big Creek No. 1, annexation.....	Johnson	440
12	Wetaug.....	Union-Alexander	8,500
	Total.....		30,320
<i>Overflowed areas</i>			
13	Along Little Cache River.....	Johnson	500
14	Along Dutchman Creek.....	Johnson	1,500
15	North of Upper Cache District.....	Union-Johnson	1,500
16	Along Upper Cache River-Bradshaw Creek.....	Union	4,000
17	Along Cypress Creek.....	Union	2,500
18	Along Big Creek.....	Union	1,600
19	Along Cache River (west end).....	Pulaski-Alexander	18,200
	Total.....		29,800

struction was commenced in 1912. Cache River was dredged to a point about two miles southwest of Ullin, and the Foreman Floodway and the Post Creek Cut-off were constructed. The Foreman Floodway was a cut-off from the C. & E. I. Railway crossing below Foreman to the original channel at a point about one and a half miles east of Karnak. The Post Creek Cut-off was constructed from this point south to Ohio River, and diverted a part of the flood water from Cache River. Five sub-districts were formed for constructing lateral ditches to the main outlet. Over \$500,000 has been expended to the present time, but still certain portions of the district are subject to overflow. The commissioners are now planning to enlarge the Foreman Floodway and the Post Creek Cut-off, using a 60-foot bottom width

for the former ditch and an 85-foot bottom for the latter, except along the south 1.1 miles which is to be 70 feet in bottom width, but with flatter side slopes. These cut-offs are intended to take the flood water of the upper end of the district. In making the plans for these improvements the commissioners received engineering assistance from the State Division of Waterways, Department of Public Works, and from the Bureau of Public Roads, U. S. Department of Agriculture.

The Vienna Drainage District, containing 5,500 acres was organized in 1914 and completed in 1917 at a cost of \$25,400. It is not entirely successful due to an unsatisfactory outlet into Upper Cache River. This district embraces lands along Dutchman's Creek and Little Cache Creek. There are 1,500 acres to the north along the former creek and 500 acres along the latter that should be included in the district. The organization of the Upper Cache River Drainage District, which is now in the petition stage, will be of benefit to the Vienna District, and both districts will be improved by the construction of better outlets by the Cache River District.

The Belknap Drainage District contains 5,900 acres, adjoins the Cache River District on the north, and was constructed at a cost of \$40,833. As this district is in the Cache River valley it will be benefited by the Cache River District improvement and will probably join the latter in carrying out its plans. Cypress Creek runs through the district. On the upper end of this creek there are 2,500 acres of overflow land which should be annexed either to the Belknap District or the Big Creek District No. 2.

The Upper Cache River Drainage District is now in the petition stage. Surveys are being made and it will undoubtedly be organized. About 5,500 acres of overflowed land on the upper end of this stream in Union County should be included in the district, but so far the objectors have succeeded in keeping out this area. As stated above, this district will provide a better outlet for the Vienna District.

Big Creek Drainage District No. 2 lies in the northeast corner of Pulaski County on the north side of Cache River. This district is in the same situation as the Cache River District across the river. Big Creek District No. 1 is just west of Big Creek District No. 2. It is operating satisfactorily, except when Cache River overflows. It is now proposed to enlarge the district by taking in 440 acres to the north in Union County. There are 1,600 acres more along Big Creek which should be annexed to Big Creek District No. 1.

The overflowed area along Mill Creek is being organized into the We-taug Drainage District. The proceedings are now in court and the organization is being held up by the objectors.

To the northeast and south of Tamms and to the south and southwest of Ullin there are 18,200 acres along Mill Creek and Cache River which are overflowed and which are not in a drainage district.

The Richland Drainage District is situated just southeast of Olive Branch. It is overflowed by both Cache and Mississippi rivers, and levees should be constructed on the south and east sides and a pumping plant installed to take care of rainfall within the district during flood stages.

The Cairo Drainage District adjoins the city of Cairo on the north and is a levee district. It was organized in 1889 and thus far has cost \$583,707 but a large amount of this money has been furnished by the Mississippi River Commission. The assessment against the land in the district has been about \$20 an acre. The pumping capacity of this district is inadequate, and in all probability will soon be increased.

The Mounds Drainage and Levee District is organized and affirmed by the Court, but as yet no assessments have been spread. There are 7,520 acres in the district and the cost of construction is estimated at \$255,000.

The Pulaski Drainage District was organized in 1899 but has not been successful. It is planned now to dissolve the district and to organize a new one to be known as Boar Creek which will include most of the Pulaski District.

Of the 183,550 acres of land within this watershed which were originally worthless and unproductive, 123,430 acres or 67 per cent have been organized within drainage districts and in whole or in part reclaimed. As Cache River is the outlet for all of the districts, the proposed improvement in that stream and the Post Creek cut-off of the Cache River District will result in the total reclamation of the area now in organized districts as well as the 30,320 acres which are now being organized. The remaining 29,800 acres will no doubt be annexed to existing districts as soon as some of these districts are completely reclaimed and the advantages of thorough drainage demonstrated.

The sentiment for drainage is quite favorable, but the landowners have been disappointed in the results of their work so far and now are emphatic in their demands that any further construction must be well planned and adequate to give complete protection to all the lands concerned.

The drainage data for this watershed are given in Table 29, from which it is seen that:

1. Nine districts with an aggregate area of 123,430 acres have been organized.
2. Three districts are now being organized which, if successfully completed, will add 30,320 acres to the above total.
3. There are 29,800 acres of overflowed land outside of districts for which no provision is being made. At a very conservative estimate there are 10,000 acres within districts which cannot be farmed, making a total of 39,800 acres which remain to be reclaimed. This is 25 per cent of the area originally in need of drainage.

CHAPTER XXIX—OHIO RIVER WATERSHED

The Ohio River watershed, as considered in this report, contains 800 square miles and covers parts of Hardin, Pope, Johnson, Massac, and Pulaski counties. There are 32,700 acres of overflowed lands in this watershed, of which 23,700 acres lie in the Ohio River bottoms.

The topography of Hardin County is such that drainage districts are not necessary, except in two places along Ohio River. One of these is located in the bend of the river in the southwestern corner of the county, and the other in the southeastern corner. There are about 2,000 acres in the former tract and 1,500 in the latter. The soil is very fertile, large crops are obtained occasionally, and the land is worth permanent reclamation. Both of these projects would require levees.

In the southern part of Massac County, two contiguous areas of overflowed lands are shown on the map. These might be combined in one levee district. The two areas together contain 20,200 acres, and make an excellent reclamation project. Only a small amount of this area is being farmed at present, due to the wetness of the soil, and that which is being farmed produces a crop about one out of three years. There is considerable sentiment in favor of reclamation in this community, but the landowners feel that the Federal Government should build the levees. It is believed that proper encouragement on the part of the Federal or State Government would result in the reclamation of this land.

The remainder of the river bottom land, which is between Cairo and Mound City, is protected by levees.

Along upper Bay Creek and its tributaries, Johnson Creek, Max Creek, and Cedar Creek, there are about 6,000 acres of land which are overflowed. Only about one out of five crops are harvested from this bottom land. It is very rich soil and its reclamation would prove very profitable. The Upper Bay Creek District, embracing this area, was started about three years ago, but was thrown out of court because of the objections of a few of the older landowners, who seem to be opposed to progress. The sentiment for the organization of the district was very strong, and the petition was signed by a good majority of the landowners, and it is not clear why a few objectors were able to defeat the organization of the district. The landowners who favor drainage are bitter against a drainage law which in its operation enables a small minority to overrule the majority.

Along the lower end of Sugar Creek, which empties into Big Bay Creek west of Reevesville, about 1,000 acres of land is overflowed, and should be annexed to Bay Bottom District. Also along Flat Lick Branch there are some 2,000 acres of such land, which should be annexed to the Bay Bottoms District.

TABLE 30.—*Drainage data for the Ohio River watershed*

Refer- ence No.	Name of district	County	Area
<i>Organized drainage districts</i>			
1	Bay Bottoms.....	Pope	<i>Acres</i> 12,100
<i>Districts being organized</i>			
	None.....		
<i>Overflowed areas</i>			
2	Southeast corner of Hardin County.....	Hardin	2,000
3	Southwest corner of Hardin County.....	Hardin	1,500
4	Along Flat Lick Branch.....	Pope	2,000
5	Along Sugar Creek.....	Pope	1,000
6	Along Upper Bay Creek.....	Johnson-Pope	6,000
7	East of Brookport.....	Massac	2,000
8	Southeast of Brookport.....	Massac-Pope	18,200
	Total.....		32,700

Only one organized drainage district lies in this watershed, namely, Bay Bottoms District, organized in 1912 and containing 12,100 acres. The project has not been successful since only 60 per cent of the area is under cultivation. Also there has been considerable litigation in this district. Recently they lost an injunction suit against the Cache River District to prevent that district from building a levee on the west of Bay Creek to keep the Bay Creek waters from flowing westward during flood periods into the Cache River District. The levee of the Cache River District will make the watershed line between Bay Creek and Cache River about as shown on the map.

The value of the bottom land has increased very rapidly where the ditches have given relief, but the best lands are still too wet to cultivate.

The northern part of Pope County is very rugged, and the southern part is generally broken with low ridges, so there is no need of artificial drainage in the uplands. At the western end of the Ohio River watershed, there are two districts which border on the Ohio River, but which are mainly in the Cache River watershed and are listed under that watershed.

Table 30 gives the drainage data for this watershed from which it is seen that of the 44,800 acres originally subject to overflow, 32,700 acres, or 73 per cent, remains in its original condition.

PART II—ENGINEERING PROBLEMS

BY G. W. PICKELS

CHAPTER XXX—CHANNEL IMPROVEMENT

The purpose of channel improvement is to increase the discharge or carrying capacity of a stream so as to enable the water to flow off faster and thus decrease the height and duration of floods.

There are only two ways in which the discharge of a stream can be increased, viz.: (1) by increasing the cross-section or size of the channel, and (2) by increasing the velocity or rate of flow of the water.

INCREASING THE CROSS-SECTION

It is not feasible usually to enlarge the channel of a stream so as to retain all the flood waters within its banks. Where the stream is a small shallow one, draining a small watershed, and where the depth of overflow is small, and the period of overflow short, it may be possible to do this. In this case, the width of overflow would be comparatively small, and the construction of levees to protect the land would be out of the question from the standpoint of cost; and since entire protection against damage lies in the capacity of the channel, a greater expense can be incurred in channel enlargement than in larger valleys. However, in the case of larger streams, such as Kaskaskia, Embarrass, Little Wabash, and Skillet Fork, it would be economically impossible to attempt to handle the flood waters in this way. In these valleys, a channel from 1,000 to 1,800 feet in width would be required to pass the flood waters within the river banks. The cost of such enlargement would be much more than the value of all the land reclaimed, based even on its reclaimed value, and consequently is not to be considered. Protection from overflow along these and similar streams—except possibly at their upper ends—cannot be secured by channel improvement alone, and such improvements must be supplemented by the construction of levees. Hence the extent of channel improvement must be given careful consideration, and care must be taken that the expenditures for such purpose do not exceed the benefits to be derived therefrom. Usually engineers place the profitable limit of channel widening at from 100 to 125 feet, because of increased cost of construction.

INCREASING THE VELOCITY

There are three factors which affect the velocity of flowing water. These are: (1) the slope of the water surface, (2) the hydraulic depth, or the ratio of the area of the cross-section to the wetted perimeter (the bottom

and side slopes of the channel up to the water surface), and (3) the friction between the flowing water and the bottom and banks of the stream, technically known as the roughness factor. These will be discussed in reversed order.

FACTORS AFFECTING THE VELOCITY

ROUGHNESS FACTOR

The magnitude of the effect of the roughness of the bottom and side slope of a stream and of grass, weeds, willows, etc., and of tree trunks, stumps, and other debris upon the discharge of a stream is not realized by the average person. In a large stream, such as Illinois River, the width and depth is such that the roughness factor is insignificant; but for smaller streams and drainage ditches, it is a factor of considerable importance. In general, it may be stated that the discharge of such streams in their natural state can be increased about one-third by the removal of sand bars and other deposits and debris from the channel, and by the cutting of trees and other vegetation along the slopes and banks. In fact no greater return can be obtained for the amount expended by any other form of improvement.

The roughness factor also includes the checking of the flow of the water at sharp bends in the stream, and where such bends can be eliminated by short cut-offs it is usually profitable to construct them. The construction of cut-offs, however, introduces other elements which will be considered later in the discussion. It should be clearly understood that broad bends are not objectionable and streams should not be straightened for this reason alone.

There are a number of small creeks in the State along which the overflowed areas are small and do not justify any greater expense than that occasioned by channel cleaning; and frequently this would give satisfactory relief from overflow.

HYDRAULIC DEPTH

While this is an important factor at different stages of a stream, yet during flood periods, when the entire channel is full of water, its effect is not so marked. The velocity is increased when the hydraulic depth is increased. This can be done either by deepening or widening the channel.

For example, suppose the bottom width of a channel is 40 feet, the slope of the bank 1 to 1, and the depth of flow 12 feet. If the bottom of the channel is lowered three feet by dredging, the slope remaining the same, the bottom width would be 34 feet and the depth of flow 15 feet. This deepening of the channel would cause the water to flow 7 per cent faster.

If the original 40-foot channel, instead of being deepened, were widened to 60 feet, the increase in the velocity would amount to about 4.5 per cent. Hence it is seen that increasing the depth has a greater effect upon the

velocity than increasing the width. Since the outlet of a stream cannot be lowered, the deepening of the channel upstream decreases the slope of the stream, and the loss in the velocity due to the flatter slope is usually greater than the increase in the velocity due to the greater hydraulic depth. In channel improvement it is seldom that the bed of the stream is lowered except where depositions have formed. Also any widening of the channel is done to increase the cross-section, and thereby the discharge, rather than the hydraulic depth. Hence it is seen that this factor is not of much significance in channel improvement.

SLOPE OF STREAM

The velocity of flowing water varies as the square root of the slope. For example, to double the velocity it is necessary to increase the slope four-fold.

Since the total fall between any two points on a stream is constant, the only way in which the slope, or fall per unit length, can be increased is by shortening the channel of the stream. As most of the streams subject to overflow wind back and forth across their flood plains, they are readily susceptible to shortening. The crooked channels of most of the streams under consideration are about twice as long as the straight channels which might be constructed. The effect of this maximum straightening is to increase the velocity of the water about 40 per cent. The question to be decided is whether this maximum increase in velocity is justified by the cost of the large amount of excavation necessary in constructing the channel of maximum straightness. In the case of small streams, where levees are impracticable, the answer to this question *may be* in the affirmative; but for the larger streams, it is usually decided in the negative.

RESULT OF CHANNEL STRAIGHTENING DUE TO INCREASED VELOCITY

One of the most important engineering problems which arises in flood protection work is the amount of channel straightening which is justifiable. Where the construction of a short cut-off will eliminate many times its length of old channel, and the topography is favorable, there can be no doubt as to the advisability of constructing such a cut-off; but in the many other cases where a comparatively short distance is saved by a proposed relocation of channel, a decision can be reached only after a careful study of all the factors involved.

It cannot be too strongly emphasized that from the standpoint of channel correction a stream must be treated as a unit. It is absolutely futile to attempt work of this kind piecemeal. No more water can flow past any point in a stream than can flow through the most restricted portion of that stream. The fundamental principle in all channel design is to keep as uniform a velocity as possible throughout the system so that any material which

enters the channel in suspension will be carried through to the outlet and not be deposited at some point in the channel to form a bar that will affect the operation of the system. For this reason, some agency other and larger than local organizations should have the supervision of the planning and carrying out of this first step in the reclamation of the bottom lands subject to overflow.

For the purpose of discussion, let us assume that by the maximum straightening of a stream, the velocity of the flowing water is doubled, due to the increased slope, the greater hydraulic depth of the new channel, and the decrease in the roughness factor. This value is admitted high, but is chosen because even numbers are easier to deal with than fractions. Also let us assume that the length of the new channel is just one-half that of the old channel. Overlooking the fact that the construction of such a channel might not be justified on economic grounds, let us discuss its desirability.

The flooding of the bottom land is caused by the fact that the water enters the valley faster than the channel can discharge it. A flood period can be divided into three stages. The first stage is that from the beginning of the storm till the stream overflows its banks; the second stage is from this point until the crest of the flood is reached; and the third stage is the period during which the flood waters are receding until the stream is again within its banks.

Let us consider the effect of channel improvement—based on the above assumption—upon these three stages. Since the velocity of the water in the new channel is twice that in the old, the former discharge at the bankful stage will now be carried at approximately one-half the bankful stage, and it will take a more severe storm or one of longer duration to cause the stream to overflow. Former minor floodings of the bottoms would be eliminated, so the effect of the improvement would be to increase the length of the first stage.

During the second stage, since the water is carried away twice as fast by the new channel, the rate of increase of the depth of overflow would be decreased, the high water mark of the flood would be lowered, and the crest of the flood would be reached in a shorter period than formerly.

The duration of the third stage would be decreased, since the channel is discharging its water twice as fast as it did through the unimproved channel.

So it would seem from the above reasoning, that the improvement would be beneficial at all stages of a flood. However, there is a fallacy in the premises upon which the foregoing conclusions are based, namely, that the same volume of water is present at *all points* in the valley as was the case before the channel was improved. It is true that the water enters the valley from the nearby hills and through the tributaries in the same quantities and at the same rate as before, but the *distribution of the water* in the valley is entirely different, there being a smaller volume at the upper end of the valley

and a larger volume at the lower end. It is only at the upper end of the watershed that the above conclusions are even approximately correct, and proceeding downstream the error becomes increasingly greater. For while it is true that the new channel at a given point can discharge twice as much water in a given time, it is also true that twice as much water is being brought to this point from the valley above as formerly; and hence the channel is taxed to its full capacity, just as it was formerly, and has no excess capacity for handling within its banks the water which enters the valley from the nearby tributaries. The result would be just as serious a flooding of the middle and lower reaches of the valley as before, though the *period of flooding* would be shortened. If this period can be shortened so as to prevent damage to crops, the improvement is beneficial; if not, little is gained thereby.

EFFECT OF SHORTENING CHANNEL

Thus far only the effect of the increased velocity has been considered. There remains a still more important factor, and that is the effect of the decrease in the distance which the water has to travel in passing through the valley.

In order that this effect may be better understood, let us consider two watersheds of the same size and with the same rainfall and run-off, but of different shapes. The first watershed is fan-shaped with all the tributaries entering the main stream at approximately the same point. The second watershed is long and narrow, the tributaries entering the main stream at different points throughout the valley. If both watersheds are subjected to storms of equal intensity, the first watershed will suffer more from flooding than the second, due to the fact that in the first watershed the flood crest of the several tributaries will reach the main stream at about the same time, and the result of the concentrated flow will be the flooding of the main valley; whereas, in the second watershed, the water from each tributary will reach the main stream and flow off before the water from the tributary above has time to reach the tributary below; and there will be no concentration of the flood crests of the several tributaries except in floods of long duration. Thus it is seen that fan-shaped watersheds, or watersheds where the distances between the mouths of the tributaries are short, are subject to more frequent flooding than long narrow watersheds, where the distances between tributaries are greater.

The above illustration applies to the case under discussion. The straightening of an old channel brings the tributaries closer to each other so far as the time required for the water to travel between them is concerned. In the assumed problem, the length of the old channel has been halved, and the velocity of the water doubled, so that water from any point in the valley will reach any other point in just one-fourth the time it formerly required.

The water entering the new channel at the upper end of the valley will reach the lower end of the valley in just *one-fourth* the former time; since the water is being discharged from the lower end of the valley only *twice* as fast as under the old conditions, the result must be a piling up of the water at the lower end and a more serious flood condition. There will be less water at the upper end of the valley and more water at the lower end. This is a phase of stream straightening which has not been given sufficient consideration.

GENERAL DISCUSSION

In the foregoing discussion, a free outlet at the end of the valley was assumed. This is a condition which does not exist if the outlet stream is also at flood stage which is usually the case during the more severe storms. The high stage in the outlet stream decreases the slope at the lower end of the stream under consideration and the water will not leave the valley at twice its former rate.

Another factor to consider is the more rapid filling up of the channel at the lower end due to the larger amount of material which will be eroded and carried in suspension because of the increased velocity of the flowing water. This material will be deposited as the velocity is checked due to the backwater at the lower end.

In the case of the smaller valleys it may be possible to enlarge the channel sufficiently at successive points downstream to remedy the undesirable conditions mentioned; but for the larger valleys this is not feasible.

Thus it is seen that the subject of stream straightening is very important, and consequently one which should not be decided until all the factors affecting it are known and intelligently considered. Each valley is a separate problem; for while the rainfall and run-off factors of neighboring valleys may be very similar, the times of concentration of the flood waters are certain to be quite different. Not only the valley of the main stream but also each tributary watershed must be studied.

It must not be inferred from this discussion that streams should not be straightened at all, for they should be. The question is one of extent. Every proposed cut-off should be considered on economic grounds and on the effect which it will have upon the valley as a whole.

If the reclamation of the bottom lands rests upon the coöperation of individual landowners to make the investigation and studies necessary for an intelligent solution of the channel straightening problem, the lands will never be reclaimed, unless it be in a piecemeal fashion, each locality protecting itself without a thought as to the effect of its work upon the lands above and below. Too much of this has been done already, and should not be permitted to continue. It would seem that the work of scientific investigation and the making of plans and recommendations might very properly be a function of the State. There are those who think that the State should

also give financial assistance in straightening the crooked channels ; but upon this point the writer is not prepared to give an opinion. However, since the State will profit largely through increased revenue, it certainly should be concerned with the reclamation of the waste bottom land, and should do its share in thus developing the natural wealth which lies in the fertile bottom land soils.

CHAPTER XXXI—LEVEES

Levees are small earthen dams placed at varying distances from the banks of a stream to serve as artificial banks during flood periods when the stream gets out of its natural banks, and to protect the major portion of the bottom land from overflow.

Levees are justified and should be constructed in any valley where the interest on their first cost and annual maintenance is less than the net annual increase in the returns from the land which is protected by them.

The construction of levees is the second step in the reclamation of the bottom lands, the first being the cleaning and straightening of the channel in accordance with the principles discussed in the preceding chapter. Where the valley is narrow, levees may take the form of carefully constructed spoil banks made from the material excavated from the channel during the process of channel improvement, and additional protection may be secured in this way with little additional expense.

DESIGN OF LEVEES

The factors entering into the design of levees are:

1. The crown or top width,
2. The slope of the sides,
3. The height, and
4. The free board, or height of levee above that is necessary to carry the waters of the greatest known flood in the past. This acts as a factor of safety against still greater floods, and allows for any errors in the design of the levee system due to insufficient data on past floods.

CROWN

The crown of a levee should be from three to eight feet in width, depending upon the strain to which the levee is to be subjected and upon the amount of freeboard which is allowed. Along the larger streams, the flood waters stand for weeks against the levees, and should they become saturated there is danger of the upper portion sliding upon the plane of saturation, resulting in a crevasse. Also along such streams, the levees are subjected to the eroding effect of waves. Under these conditions the maximum crown should be used. However, for the majority of the streams within the State, the flood waters do not remain long at a high stage, and the three-foot crown is sufficient, if ample free-board is allowed for in the design.

SIDE SLOPES

The slope of a levee on the river side should ordinarily be 3 to 1, that is, three feet horizontally to one foot vertically. If the material available for the levee is largely clay, a 2.5 to 1 slope is permissible for the smaller

streams. This is the minimum which should be used. The slope on the land side may be steeper. If a 3 to 1 ratio is used for the slope toward the river, 2 to 1 may be used on the land side. The sum of the two slopes should be not less than 5 to 1.

HEIGHT

The height of a levee depends upon the cross-sectional area necessary to pass the maximum flood discharge, the distance between the levees, which confine the flood waters, and the elevation of the ground upon which the levee is to be built. Obviously this is a very important element in levee design; for if the levee is too low the land behind it will be flooded, while if it is higher than necessary, money is wasted in its construction. The economic height of levee involves a careful engineering study, taking into consideration the many factors which affect it. This will be discussed more fully later.

FREEBOARD

It is customary to provide a margin of safety by making the top of the levee higher than the highest high water mark of any known flood in the past, allowance being made for the fact that when confined within levees the crest of such a flood would be higher than when the entire valley was available as a flood-way. This additional height is known as freeboard, and is usually taken as from two to four feet.

COST OF LEVEES

For the sake of comparison it is thought desirable to give the cost of levees of various heights. Since for the average stream within the State a levee with a crown of three feet and combined side slopes of 5 to 1 is most applicable, these values have been used in computing the volumes and costs given in the following table:

TABLE 31.—*Cost data for one mile of levees of different heights, using crown of 3 feet and combined side slopes of 5 to 1*

Height	Volume	Cost	Increase in cost
<i>Fl.</i>	<i>Cu. Yds.</i>	<i>At 20 cts per yd.</i>	<i>Per foot</i>
6	21,120	\$ 4,224	.....
7	28,062	5,612	\$1,388
8	35,982	7,196	1,584
9	44,880	8,976	1,780
10	54,755	10,951	1,975
11	65,610	13,122	2,171
12	77,440	15,488	2,366
13	90,250	18,050	2,562
14	104,036	20,807	2,757
15	118,800	23,760	2,953

It is to be noted that the difference in the cost per mile of a 6-foot and a 7-foot levee is \$1,388; while that between a 13-foot and a 14-foot one is \$2,757, or twice the former amount.

DISCHARGE

During flood periods, the bottom land of a river valley is overflowed because the flood water is brought to the valley by the tributary streams faster than it can be carried away by the river channel. Thus the flood plain becomes a temporary reservoir for storing the surplus water until such time as the channel can carry it away.

When the waters are confined by levees on each side of the river, the artificial reservoir thus formed is much narrower than the natural one—probably only one-tenth as wide. Since approximately the same volume of water must be stored—ignoring the increase in velocity due to greater depth of flow—the crest of a flood will reach a greater height than formerly. Just how high and how far apart the levees will have to be depends entirely upon the volume of water to be carried between them.

The determination of this volume is by far the most important engineering problem which enters into the successful leveeing of a stream. The factors involved are: (1) the length and intensity of storms; (2) the shape of the watershed, whether long and narrow with short tributaries entering at distributed points throughout the valley, or short and wide with long tributaries entering the main valley at points close together; (3) the topography of the watershed, whether flat or steep; (4) the soil of the watershed, whether a pervious loam or sand, or an impervious clay or rocky soil; and (5) the slope and general character of the main channel, that is, whether it is fairly straight and clean or crooked and full of bars, drift, etc.

Even with the above information, it is difficult to form anything more than a general conclusion in regard to the probable maximum discharge.

The only satisfactory method of determining the discharge is to measure it. This is done by establishing gaging stations at a number of suitable points in the valley and measuring the velocity of the flowing water at various stages of the stream, preferably by means of a current meter. In order to secure measurements at the higher stages, observations during a number of years are necessary. However, when several landowners decide to organize a levee district, they do not want to wait until such measurements can be made, neither do they care to go to the expense of establishing gaging stations for that purpose. Since eventually all of the larger valleys will be leveed, if discharge measurements were started now on all such streams, the desired information would probably be available by the time it is needed. Naturally, this work of scientific investigation should be carried on by federal or state agencies. As a matter of fact, such is now the case on a small scale. The U. S. Geological Survey has established about twenty such

stations in the State, and the results thus far obtained have been of considerable value.¹ However, many more are needed. In addition, there are many staff gages installed on highway and railroad bridges along most of the streams, and the highwater elevations of extreme floods are matters of record. These are very helpful, and in conjunction with certain field measurements made later, a fair determination of the discharge during floods can be obtained.

It is not the intention to discuss here the engineering details connected with stream discharge measurements. It is simply desired to call attention to the importance of the matter, and the need for scientific investigation of run-off in the valleys of the State.

SPACING AND HEIGHT OF LEVEES

Having determined the discharge of a stream during severe floods, and the cross-sectional area of flood-way necessary to carry it, the next question is what shape of cross-section is most economical; that is, shall the levees be placed close to the banks of the stream and be comparatively high, or shall they be placed farther from the banks and of a lower height. This is purely a question of economics. The closer the levees, the greater will be the area of farming land reclaimed, but the cost of the levees will also be greater. It is simply a matter of balancing one against the other and of finding that location at which the annual net returns from a narrow strip of reclaimed land is the same as the interest on the additional cost of the higher levee required to reclaim the strip. Local conditions would of course modify the general procedure somewhat.

In designing levees at the lower end of a valley in which the channel has been or is to be straightened, it must be remembered, as pointed out in the preceding chapter, that during severe storms the flood heights will be greater than before the channel was improved, and the levees must be either higher or farther apart.

CONSTRUCTION OF LEVEES

Since a levee is subjected to the percolating effect of water and to the eroding action of the current and waves during floods, it should be constructed of the most impervious material at hand and should be made as compact and solid as possible.

The best material for this purpose is clay and the poorest is sand and gravel. There is usually not much choice, since the material adjacent to the levee must be used in its construction. However, generally the top soil is more porous than the subsoil and should not be used.

Levees fail either by being overtopped by the flood waters or by sliding

¹The U. S. Geological Survey publishes these results in its Water Supply Papers annually. A complete list of the bulletins is to be found in their list of publications.

along the foundation plane. The former danger is eliminated by a correct design; the latter by using care during construction. To prevent the water from percolating through the more porous original top soil, either this soil should be removed down to the more compact sub-soil, or a cut-off wall should be constructed. The latter is done by excavating a trench a little forward of the center of the levee, making it from four to eight feet wide and of about the same depth, and filling it with the most impervious material at hand.

Before the levee is started all stumps and decaying vegetable matter should be removed and furrows plowed in the foundation parallel to the axis of the levee. This provides a better bond between the levee and the foundation and is additional insurance against sliding.

No logs, vegetable matter or other substances which will decay and leave openings in the levee should be permitted in its construction. If, due to methods of construction or to the nature of the material used or to the character of the foundation, any settlement of the levee is likely to occur, its top should be made slightly higher than the desired elevation to allow for any such settlement.

When a levee is constructed by a dipper or a grapple dredge, it is difficult to obtain a smooth crown, and usually the top of such a levee has the appearance of a miniature mountain range, and unless care is taken some points will be below the required elevation. A levee of this kind should be gone over with a team and scraper and leveled off and then the elevation of the top checked.

When a drag line machine is used, a much more uniform levee section and one of better appearance is secured, but not necessarily a better or stronger levee.

The material for the levee should be taken from the river side, and the edge of the borrow pit from which it is excavated should not be closer than 40 feet to the bottom of the levee. This is especially important in the case of high levees. Borrow pits should be constructed so that the water can run out during normal stages of the river.

MAINTENANCE OF LEVEES

As soon as possible after a levee is constructed, its surface should be sowed with some grass which will not form too rank a growth, but whose roots will form a tough sod. Different soils require different grasses or a combination of several kinds. For clay soils, a mixture of Kentucky blue grass, English rye, and red top is suitable, the latter two protecting the former which forms the permanent covering; for sandy soils a quickly growing binding grass which will grow with little moisture is necessary. Creeping bent and fine leaved fescue fulfills this requirement. This is the best possible protection against erosion and wave action and will give the desired

result except in specially bad places along large streams like the Mississippi and Illinois. If the slopes of the levee are smooth, the grass can be mowed by machine. A screen of willows between the river and the levee is frequently desirable to prevent erosion due to current and wave action. The remainder of the flood-way should be kept cleared, so as not to retard the flood waters. Levees should be carefully inspected at least twice a year, especially at first, to discover weak spots which may have developed. Where roads cross a levee it is liable to become lower at those points and if for any reason the grade of the levee is not maintained, excess material should be provided nearby for use in emergency.

CHAPTER XXXII—DIVERSION DITCHES

A diversion ditch is one constructed to intercept the water which would otherwise flow into a district from the lands outside, and to carry it around the district to the outlet stream below.

All districts located in river valleys are troubled more or less with the water which naturally runs into them from the higher land outside their boundaries. This problem has confronted most of the districts along the Illinois and Mississippi rivers, and will have to be met by future districts along the smaller streams within the State.

In some levee districts it may be possible to operate satisfactorily without pumping plants, if the hill water can be kept out. In such cases diversion ditches should by all means be constructed.

Districts which maintain levees are especially troubled with the hill water problem. Many such districts along the Mississippi have protection from the flood waters of the river but are subject to a "rear attack" by the hill water, which collects in the old lakes and sloughs behind the levees. In Chapter II on the Mississippi watershed, many districts are described which have been only partially successful due to this difficulty.

In some instances the hill water enters the valley through one stream which follows a winding course across the flood plain to the river. If the volume of water is not too great, the main ditch of the district may tap the stream at the bluffs and be made large enough to handle its waters as well as that of the land in the district. If the cost of the extra excavation required by this plan is greater than the cost of a diversion channel from the bluffs to the river, the water should in most cases be diverted. Where the volume of flood water carried by the hill stream is large, it should ordinarily be carried directly to the river, and a levee be constructed on each side of the ditch to prevent the flooding of the land in the district, which is usually lower at the bluff than at the river. Frequently such a stream will form a natural division line between districts. For example Bear Creek in Adams County forms the joint boundary of the Lima Lake and Indian Grave Districts; likewise Apple Creek in Green County separates the Hartwell and Keach Districts; and Macoupin Creek was diverted directly into the Illinois and is the boundary of the Eldred and Nutwood districts. Many more examples of this kind might be cited.

If the hill waters enter the district through a number of small channels in large enough quantities to be objectionable, a diversion ditch along the foot of the bluff will intercept all of them and carry their waters around the lower end (usually) of the district to the outlet stream below.

If the levee district has a pumping plant, as it usually should have, and the volume of water from the bluff is small, it will probably prove more

economical to allow the water to enter the ditches of the district and be pumped over the levee; but for large volumes it is much cheaper to construct a diversion ditch than it is to install pumps of sufficient capacity to handle the additional water. Under what conditions it becomes more economical to divert the water than to pump it, involves careful engineering study; and hence drainage commissioners having this problem will save money for their districts by consulting a competent drainage engineer.

In many cases diversion ditches are necessary for the successful operation of districts. Many of the most successful districts along Illinois River have diverted the hill streams.

The factors which determine the run-off from the hill lands, in the order of their importance, are as follows: (1) the slope and roughness of the land surface; (2) the character of the soil, whether loam, sand, clay, or rock; (3) the cultural features, that is, whether the land is under cultivation or covered with trees, brush, and other vegetation; (4) the size of the watershed; and (5) the amount of rainfall.

It may be wondered as to why the factor of rainfall is given last in the above enumeration. This is because there is very little difference in the intensity of storms to which all watersheds in the Mississippi valley are subjected at different times and because all the watershed areas under consideration are small. The first three factors are the important ones. It can readily be seen that the run-off from an area with steep, rocky or clayey slopes, free from vegetable growth, will be much greater than from a less rugged area with more pervious soil, and with some vegetal cover.

Districts are damaged not only by the water from the higher land but also from the silt, sand, and gravel carried down by it.

Not enough attention has been given to keeping sediment out of the drainage ditches, including diversion ditches, and commissioners have been put to much expense and trouble which might have been prevented.

Where the water enters the ditches of the district, much silt is deposited and must periodically be removed. To catch the silt before it gets into the ditches a few districts have provided sedimentation basins at the foot of the bluffs. These basins are surrounded by levees with an inlet for the hill streams and a higher outlet at the ditch end. The pond thus formed checks the velocity of the water, the material carried in suspension is consequently dropped, and the water flowing out of the basin into the ditches is practically free from coarse sediment and drift. Eventually such a basin will be filled and may become cultivable; and an adjacent area must be used for a new basin. Such basins are advisable for diversion ditches also.

Low check dams constructed at intervals in the channel of the hill stream will also have the effect of reducing the velocity, and at least the heavier sediment will be deposited behind them rather than be carried into

the river valley. During low water or when the channel is dry, the material collected behind the dams can be removed.

The writer has one district in mind where the ditches have been cleaned several times of the sand deposited in them, and the spoil banks have washed out beyond the right-of-way and damaged the adjoining land. The commissioners have had to buy an extra strip of right-of-way in consequence.

A plan now proposed for the Hunt and Lima Lake districts may prove applicable elsewhere and is worthy of a brief description. It is proposed to construct a diversion ditch outside of the bottom land on the slope of the higher ground in order to give the ditch sufficient grade to make the ditch self-cleaning. A dam is planned at the lower end of the hill stream so as to raise the water to the level of the diversion ditch. This dam will impound the water for a short distance upstream and cause most of the sediment to be deposited. Also several small check dams upstream are proposed. The topography lends itself admirably to this plan and it should prove effective and relieve the district of the periodic expense of cleaning ditches. The objection to the plan is that the diversion ditch is outside the district and that a right-of-way through the higher land will have to be purchased.

The construction of a diversion ditch at the foot of the bluff is the same as that of any other ditch, except that the excavated material is used to form a levee on the side toward the district.

Since a diversion ditch is connected with the river at the lower end, it is subject to backwater and consequent silting during high stages. Nevertheless it is preferable to have the silting here rather than in the main ditch of the district. In a pumping district, very little of the sediment is pumped out with the water, and practically all of the material brought down from the hills is deposited in the ditches, unless a sedimentation basin is provided.

From the foregoing discussion it is seen that diversion ditches are very necessary parts of the drainage works of most river districts. Where constructed they have given valuable protection to the land, and have been good investments in spite of the occasional cost of cleaning them.

CHAPTER XXXIII—PUMPING PLANTS

Pumping plants should be installed by any levee district in which the average annual crop loss, due to too much water, is greater than the interest on the cost of constructing and operating such a plant.

Most of the districts along Illinois River operate pumping plants and have found them to be an essential part of their drainage works. Most of these pumping districts have been established since 1905. The pumps of the early ones were entirely too small and have been added to or entirely replaced by new plants. The more recent installations are models of efficiency and the decreased cost of operation and the thorough drainage of the land has more than paid for the improvement.

Along Mississippi River in Illinois only a few districts are thus equipped with the result that a considerable portion of the land in them is too wet to be cultivated or else is only producing partial crops. The higher market value of the Illinois bottom land as compared with that along the Mississippi is an indication of the value of pumping plants.

Along the smaller streams of the State, such as the Kaskaskia, Embarrass, and Little Wabash, some levee districts may be able to dispense with pumps, especially if diversion ditches are constructed to keep out the hill water.

In some cases it is feasible and more economical to construct gravity outlet ditches leading from the lower end of the district downstream several miles till an outlet can be had in the river. Such ditches are feasible where the fall in the main stream is such that the backwater entering the outlet ditch will not reach the land in the district. Gravity outlet ditches are located parallel to the river levee and require an inside levee of gradually increasing height to keep the water out of the adjoining lands. Whether to use such a gravity ditch, where the topographical conditions permit, or to install pumps is purely an economic question. In comparing the costs of the two plans, the annual operation and maintenance of the pumping plant must be considered as well as the initial cost.

Pumping should be avoided if possible, since it is a source of continual trouble and expense. It is suggested, where there is any question as to the necessity of pumps, that their construction be delayed until the other drainage works are completed and in operation, and then if the land is too wet and the consequent damage to crops sufficient to warrant the expense, it will be an easy matter to add the pumping equipment.

It is not necessary to operate the pumps through the entire year and most districts pump only from 60 to 90 days of 24 hours each. In the late summer and fall, when the precipitation is usually light and the evaporation high, pumping is rarely needed. During the winter months the

ground becomes saturated unless occasional pumping is resorted to. This practice is followed by some districts. In the spring the pumps are run day and night until the water in the districts is lowered sufficiently, and then they are operated during the day only. After a while days are skipped and the periods between pumpings increase until presently pumping is required only after heavy rains. Frequently the sluice gates can be used at this time and the pumps are not needed. If a district will give proper attention to its pumping, so as to keep the ground water at a low elevation, the drained soil will have considerable storage capacity, the run-off during storms will be less, and a smaller pumping plant will be required.

The pumping station should be located where the water can be brought to it most conveniently and with the least expenditure for interior ditches. It is generally situated at the lower end of the district, but in a few instances the upper end has been used because of greater accessibility for the delivery of fuel. A good foundation is very essential and this factor may influence the location of the station.

The size of pump required for a district depends upon (1) the area of the district and of the land outside which drains into it, and (2) the desired rate of removal of the water from the district, which in turn is influenced by the intensity and duration of storms and the character of the high land outside. The first of these is readily determined but the second is more difficult to decide upon. The rate of removal is usually expressed in inches of depth over the entire watershed area in a period of 24 hours, and is called the "drainage coefficient." The value of this coefficient for Illinois conditions ranges from a quarter to half an inch. The factors which determine the value to be used are: (1) the intensity and duration of storms; (2) the character of the watershed outside the district; (3) the size, arrangement, and grade of the interior ditches; and (4) the availability of an area which might be used as a reservoir during extreme storms.

There is little difference in the intensity and duration of storms which might occur over such small areas as are contained in levee districts and their tributary drainage area, though in general the southern portion of the State experiences a greater annual rainfall than the northern.

The character of the hill land draining into a district has an important bearing upon the drainage coefficient. If the slopes are steep and bare, and the surface is composed of clay or rock, nearly all of the precipitation will run off and reach the ditches of the district in a short time and overtax the capacity of the pumps, unless sufficient engine power has been provided to handle the extra load.

Since the ditches of a pumping district serve as temporary reservoirs as well as channels, they are generally constructed of larger cross-section than those in ordinary drainage districts, and with flatter grades so that the water will not be carried to the pumps too rapidly.

Some districts make use of old ponds and sloughs for reservoirs during intense storms to store the water until the storm has passed and the pumps can take care of it. In this way smaller pumps can be used.

Thus it is seen that the choice of drainage coefficient involves a number of items which should be considered by some one who is fitted by training and experience to analyze them intelligently. Drainage commissioners are rarely competent to decide this question, and expert advice on this and other matters connected with pumping plant design is the best insurance against failure which commissioners can provide for their districts.

The centrifugal pump is the most suitable type for drainage work. Its advantages are that it is reliable, is simple in construction, has no valves, occupies little space, and can be obtained in all sizes. Its disadvantages are that it must be primed in starting, can be operated satisfactorily only within narrow ranges of speed, and its efficiency under practical conditions that exist in drainage pumping is low. Steam is the operating power generally employed, though electric motors and gas and oil engines are also used. The size of the pump and the availability of a coal supply or of electric power usually determines the most economical form of power.

The size of a pump is the diameter of the discharge opening and the sizes applicable to drainage districts range from 12 to 48 inches; but larger ones are occasionally used. For example the Hillview District along Illinois River in Scott and Green counties has recently installed a 60-inch pump; and 72-inch pumps have been recommended for the East Side Levee and Sanitary District around East St. Louis.

The capacity of pumps is based on an assumed discharge velocity of 10 feet per second; but as actually operated, the velocity is nearer 8 feet. This is due to the fact that as the head pumped against is increased, the

TABLE 32.—*Rated capacity of centrifugal pumps*

Size	Capacity	
	Cu. ft. per sec.	Gal. per min.
12.....	7.8	3,500
15.....	12.3	5,520
18.....	17.7	7,950
20.....	21.8	9,800
24.....	31.4	14,100
30.....	49.1	22,050
32.....	55.8	25,050
36.....	70.7	31,750
42.....	96.2	43,200
45.....	110.5	49,600
48.....	127.5	56,400
54.....	159.0	71,380
60.....	196.3	88,150

speed of the pump must also be increased, and at high-water stages some districts do not have enough engine power to furnish the requisite speed. With sufficient power, pumps can be operated at probably 25 per cent above their rated capacities with small loss of efficiency.

The rated capacities of centrifugal pumps of various sizes is given in Table 32.

For the use of land owners and commissioners in making preliminary estimates of pumping capacity required, the following table has been prepared.

TABLE 33.—*Pumping capacity required for various sizes of watersheds*

Size of watershed In Acres	Pumping Capacity			
	$\frac{1}{4}$ -inch in 24 hours		$\frac{1}{2}$ -inch in 24 hours	
	Number	Size	Number	Size
		Inches		Inches
1,000.....	1	15	1	20
2,000.....	1	20	2	20
3,000.....	1	24	1	36
4,000.....	2	20	2	32
5,000.....	1	32	2	32
7,500.....	2	30 and 24	2	45 and 30
10,000.....	2	32	3	36
15,000.....	2	45 and 30	3	48, 48, and 36
20,000.....	3	36	3	54, 54, and 45

For the larger districts, combinations of pump sizes other than those given in the table may be used, but the total capacity should not be less than that given.

The cost of a pumping plant depends not only upon the number and sizes of pumps, but also upon the maximum distance through which the water has to be lifted. The cost of such a plant at present prices can be roughly estimated by multiplying the required capacity of the pumps in cubic feet per second by the hydrostatic head pumped against, and this product by 37. For example, the total cost of a pumping station housing a 30-inch pump and the necessary engines and accessories to pump against a 20-foot head, will be about \$36,000. The cost of plants for small districts will be greater proportionally than for large ones.

The cost of operating a pumping plant depends to a large extent upon its correct design, kind of power used, and management. A plant can not be run economically unless the pumps are of ample capacity and, more important still, unless the engines are capable of very flexible operation. The engines should be adjustable for a considerable range of speed and should

be able to carry a considerable overload and to work economically through a wide range of loads.

Bulletin No. 304, U. S. Department of Agriculture, entitled "Land Drainage by Means of Pumps," by S. M. Woodward,¹ contains valuable information on this subject and the following table has been prepared from data given there:

TABLE 34.—*Cost of operating pumping plants for the years prior to 1915*

District	No. of years of operation	Cost of labor, fuel, repairs, supplies and superintendence per acre of water- shed area	Total cost, including fixed charges of interest, depreciation taxes and insurance per year per acre of watershed area
<i>Steam-driven plants</i>			
Nutwood.....	5	\$0.290	\$0.607
Eldred.....	1	.320	.713
Hillview.....	5	.439	.616
Big Swan.....	7	.405	.623
Meredosia.....	9	.394	.893
Crane Creek.....	4	.459	.807
Lacey.....	4	.366	.740
Lacey.....	2	.611	1.220
Coal Creek.....	5	.931	1.210
Spring Lake.....	5	.417	.729
Louisa-Des Moines.....	2	.392	.799
Des Moines County.....	2	.154	.404
Average.....		.432	.780
<i>Electrically driven plants</i>			
Big Swan.....	1	.627	.893
Lacey.....	2	.740	1.406
Pekin-LaMarsh.....	3	1.067	1.413
Coal Creek.....	1	.947	1.296
East Peoria.....	1	1.018	1.890
Average.....		.880	1.380

After a pumping plant is completed it should be tested to see that the pumps and engines comply with the specifications as regards capacity and efficiency.

¹This Bulletin can be obtained from the Superintendent of Documents, Washington, D. C., for 15 cents.

PART III. LEGAL PROBLEMS

BY F. B. LEONARD, JR.

CHAPTER XXXIV—THE DRAINAGE LAWS OF ILLINOIS

FOREWORD

It is the purpose of this report to attempt to lay before the legislature as clear a statement as possible of what the present drainage law of Illinois is; to suggest defects particularly in the present statute laws; and to suggest certain legislative improvements which, if made, should lessen the expense and encourage the reclamation of the wet and overflowed lands, the need for which has already been pointed out elsewhere in this bulletin. It is not our purpose to deal with the law in relation to sanitary districts, but simply to deal with the legal aspects of the reclamation of swamp and overflowed lands.

Therefore, we shall treat this subject under four main heads:

- I. The law of natural drainage in the absence of statute.
- II. The present statute laws: the Farm Drainage Act and the Levee Act.
- III. Defects in the present laws.
- IV. Suggestions for improvement by legislation.

THE LAW OF NATURAL DRAINAGE IN THE ABSENCE OF STATUTE

A very important part of the drainage law of Illinois is not found in the statutes, but is contained in the decisions of our courts establishing the rights of natural drainage of surface waters, long before any statutes on the subject were enacted.

The fundamental principle that underlies all drainage law in this State is that of allowing natural drainage; and when in a state of nature one parcel of land so lies that it drains across a lower adjoining piece of land through natural depressions, it is entitled to this natural advantage. Our Supreme Court has adopted this natural servitude as the basis for a legal rule to determine the rights and duties of such landowners. The lower proprietor cannot do anything to prevent the natural flow of surface water and cast it back upon the land above.¹

The first and most important principle, then, of drainage law is that the owner of the servient tenement is bound to receive the surface water naturally flowing to his land from higher land through natural depressions or swales. This means that a railroad embankment must be constructed with

¹Bradbury v. Vandalia D. D., 236 Ill. 36, 42.

sufficient openings to care for water that naturally flows across the right of way in a state of nature. It also means that unless a city has adopted a system of artificial drainage such as a sewer system, the owner of a lot which is lower than an adjoining lot must receive or arrange for the drainage of water coming from the higher lot.¹ There is one qualification appearing in the rule that needs to be pointed out, namely, that the surface water must drain off in a natural depression or channel. The lower landowner is under no duty to receive mere diffused water flowing on to his land from higher land.² If the law had stopped here and had limited the right of the owner of the dominant heritage to drain his land just as it had been drained in a state of nature, and had restricted the duty of the lower owner to receiving only such waters as would have come to him in a state of nature, allowing him to dam against any artificial increase, but little real advantage would have resulted, since the cultivation and improvement of land necessarily makes changes in the amount and velocity of the water drained off.

The next question that arose in the courts was as to the right of the dominant owner to collect the surface water on his land and discharge it upon the land of the servient owner. A man had a pond in his farm and proposed to cut through the rim of the pond and let the water flow off through natural channels on to lower land. The lower landowner sought to enjoin this. The court held, that in the interest of good husbandry the owner of higher land could drain his ponds or collect surface water that naturally would fall in pools and hasten its flow by digging artificial ditches on the higher land, provided that the water was discharged on the land of the lower owner at the place where, in a state of nature, it would have flowed if the pond or pools had been filled with dirt and the water thereby been forced out into the natural channels of drainage.³ This means that all lands lying within a natural basin may be drained into the tributary water course (whether a stream or a mere depression) which drains that basin; and the lower landowners cannot object that the amount of flowage is increased by artificial ditches constructed by the dominant owner on his own land so long as the artificial ditches only drain the natural basin. This sensible extension of the earlier rule gives the upper owner of the land large rights of drainage, irrespective of statute. The only limitation on hastening the flow by such artificial channels is that they must all drain one natural basin. The upper owner cannot cut through a watershed ridge and drain on to lower land, water which in a state of nature never could have reached it.

In the leading case on the subject⁴ the servient owners were represented by drainage commissioners, who brought a bill in chancery to restrain Dayton from cutting through a natural divide to drain a slough into the system of

¹Gormley v. Sanford, 52 Ill. 158.

²Bischan v. Boehl, 30 Ill. App. 455.

³Peck v. Harrington, 109 Ill. 611.

⁴Dayton v. Dr. Commissioners, 128 Ill. 271.

drainage ditches. The court held that the injunction should be granted and that Dayton had no right to divert the waters of the slough into the channel wholly different from that in which they would naturally run.

We have seen then that by common law in this state, the servient owner is under a legal duty to receive and dispose of all waters coming from higher land through natural channels and that the upper owner has the legal right, in the interests of good husbandry, to accelerate the flow in such natural channels by digging artificial ditches on his own land to carry off the water more quickly, provided that he does not cut through a natural divide and divert water on to the lower land that never could have reached it in a state of nature, but, on the contrary, would have drained elsewhere.

It is very important to get these common law rights of drainage clearly in mind for the reason that the statutory systems are based on benefits conferred by drainage districts, and in the absence of benefits conferred, a drainage district has no jurisdiction over land sought to be included in it. The courts hold that if a man has adequate drainage under the above common law rules, then he is not benefited by a drainage district under the statutes (except for sanitary benefits which are negligible), and his land cannot be included in a drainage district against his wish. In other words, before a drainage district can get jurisdiction over a man's land it must appear that he has imperfect drainage at common law. The mere fact that the ditches of a drainage district carry off water that originates on the land of a farmer does not necessarily mean, in a legal sense, that the farmer is benefited by the drainage district, for if it appeared that the water would naturally have flowed off the land of the farmer, or could legally have been made to flow off his land by artificial ditches on his own land, then he has adequate drainage at common law and he cannot be taxed simply because that water, after it leaves his land, finds its way to the larger outlets through the ditches of a drainage district.

Having noted the importance of common law rights of drainage as affecting the statutory systems of drainage, let us now turn again to the application of the principles of common law drainage. We have seen that the lower proprietor is bound to receive from the upper owner the water that naturally drains to him and that the flow may be accelerated by the upper owner, within the basin drained. It would seem that this right is not qualified by the fact that the acceleration by the upper owner actually injures the lower owner by washing his land or in other ways. In *Railroad Co. v. Adams*,¹ the defendants owned land east of the plaintiff's railroad. The natural course of drainage through defendant's land was in the form of an "ox-bow loop." The water entered defendant's land in times of rain from a rocky gorge on the east and carried sand and debris which were deposited on the defendant's land in the long meander around the loop. The defendant proposed to cut a ditch

¹221 Ill. 201.

straight through the loop and discharge the water on the right of way of the railroad at the same point where the loop had discharged the water; but the effect of the short cut was to greatly accelerate the velocity of the flow against the plaintiff's railroad embankment and also to cast the sand and debris thereon. The court held that the actual damage occasioned the railroad was no ground for an injunction.

Although no court seems ever to have considered the question, it is probable that this right to accelerate the flow by artificial ditches on the dominant tenement is limited to the requirements of good husbandry. If done wantonly, with the purpose of injuring the lower owner, then it is submitted that by analogy to the spite well and spite fence cases¹ a court of equity would enjoin the acts of the dominant owner if an improper motive were clearly shown.

There is another right of natural drainage closely akin to the right we have been considering. Not only can the owner of the dominant heritage drain his land into the natural depressions separating his land from the land of a lower owner, but he can also drain his land, within a natural basin into a creek or stream flowing through the upper land. Of course, as a practical matter the right to do this is not often questioned, because draining into a creek which has ample banks does no actual harm. But even though actual damage results to the lower proprietors, as long as the upper owner cuts through no natural divide, but simply hastens the flow from the basin into the creek which drains it, he is within his legal rights.²

Accordingly, when an upper proprietor drains his land within the proper basin into a stream, which stream is made part of a drainage district farther down, and as a part of the drainage improvement is dredged and widened, the cost of the drainage improvement cannot be assessed against the upper proprietor who drains into the stream.

It appears then to be our common law that the owner of the dominant heritage has the right to drain his surface waters into natural drainways, including both streams and mere depressions, to the lands lying below him, and that this drainage may be increased by artificial ditches within the natural basins drained by such drainways. But if a man attempts to cut through natural divides and drain on to the land of his neighbor lower down waters that could not get there naturally, the owner of the servient heritage has a right to dam against such waters³ or to enjoin in a court of equity such diversion from the dominant tenement.⁴ Of course, the owner of the dominant tenement would have no right to dig artificial ditches on his own land and cast on to the servient tenement large bodies of water that would not have

¹Barger v. Baniger, 151 N. C. 432, 19 Ann. Cases, 472; Wheatley v. Baugh, 25 Pa. 528, 64 Am. Dec. 721.

²See Railroad v. Horan, 131 Ill. 288.

³Schmitz v. Ort, 92 Ill. App. 407.

⁴Anderson v. Henderson, 124 Ill. 164.

reached such lower land through natural drainways at the particular point where the higher owner casts the water on to the lower land.¹

The whole law of natural drainage, which we have thus discussed depends upon the existence of a dominant and a servient tenement, which depends, in turn, upon a difference of level in lands. If, therefore, two parcels of ground are on the same flat level, there is no right at common law to cast water on to adjoining land or to dig a ditch through adjoining land, even though for lack of drainage both parcels may be rendered useless.² Moreover, the prohibition against cutting through slight ridges and divides often makes cultivation of swampy land very difficult if dependence for drainage must be placed solely upon the common law rights.

Another situation that calls for relief is where there is natural drainage, but the drainways have become choked or clogged, or the fall is so slight that surface waters are not carried away fast enough to allow the land to be cultivated. At common law such a situation gives no right to one landowner to go on another's land and open up a channel to drain off his lands.

Where lands are valuable for cultivation and the country depends largely upon agriculture, the public welfare demands that an adequate system of drainage shall be provided. It is the main purpose of the drainage statutes of the State to make it possible for lands to be improved for agriculture and sanitation by draining therefrom the surface waters where the natural or common law drainage rights are inadequate. This is in general to be accomplished by the organization of drainage districts for the construction, by assessment, of a system of ditches and drains, and in some cases by levees and embankments, which will divert the waters of creeks and rivers.³

THE PRESENT STATUTE LAWS: THE FARM DRAINAGE ACT AND THE LEVEE ACT

In the preceding discussion we pointed out the necessity for legislative intervention to aid the reclamation of wet and overflowed lands, namely: the slight slope of land in large flat areas which prevents the flow-off of water by gravity and the limitation imposed on the upper land owner, preventing him under any circumstances from cutting through a natural divide.

To meet this situation, after the passage of the constitutional amendment of 1878, Article IV, Section 31, which empowered the General Assembly to pass laws providing for the organization of drainage districts and gave their corporate authorities power to make drainage improvements by special assessments upon the property benefited thereby, the legislature passed two entirely separate and distinct drainage acts, one commonly called the Levee Act and the other commonly called the Farm Drainage Act. Both of these

¹Mellor v. Pilgrim, 7 Ill. App. 306.

²Deyo v. Ferris, 22 Ill. App. 154.

³Bay Island Dr. D. v. Union Dist., 259 Ill. 194, 200.

Acts were approved May 29, 1879, one taking effect on the day it was approved and the second on the first of July following. These Acts are entirely independent of each other and drainage districts organized under one Act receive no privilege or powers from the other Act.¹

An understanding of the provisions of these two Acts and of the similarities and differences between them is absolutely necessary to a comprehension of the present legal situation in drainage matters in this State. All work in drainage districts naturally divides itself into a few logical steps:

- (a) The organization of the drainage district.
- (b) Adoption of plans for work and raising money to pay for the same.
- (c) The construction of drainage improvements in the district.
- (d) The maintenance of those improvements.
- (e) Abandonment and dissolution of drainage districts.
- (f) Miscellaneous powers, duties, and succession of commissioners.

We shall take up the different provisions of the Levee Act and of the Farm Drainage Act under each of the above steps so that a comparison of the procedure under the two Acts can be made at each stage of the proceedings.

ORGANIZATION

All districts under both Acts are divided into two general classes as respects their organization: first, districts formed by mutual agreements among all land owners affected and including only the lands of the parties to the agreement; and secondly, districts formed on petition by a majority of the adult land owners owning one-third in area of the land or one-third of the adult land owners owning a majority in area of the land in which an unwilling minority whose lands will be benefited by the proposed improvement can be included in the district.

The first class of districts is found in both the Levee Act (Section 75) and the Farm Drainage Act (Section 77) and is popularly known as "mutual districts." Under the Levee Act in mutual districts (Section 75) the whole nature of the work to be done and the apportionment of the expense is determined by a written agreement among the parties and the affairs of the district are conducted by three commissioners who may be appointed by the County Court if the agreement so provides or may be selected from among themselves or outsiders and the vacancies filled by annual elections to be held on the first Monday in September of each year if the agreement so provides. Commissioners are given the powers and duties, and the mode and effect of special assessments are the same as provided in general under the Levee Act, subject, however, to any restriction contained in the written agreement.

Under the Farm Drainage Act are found the same general provisions respecting the written agreement with a provision that it may include the

¹Gauen v. The Drainage District, 134 Ill. 445; C. B. & Q. Ry. Co. v. People, 212 Ill. 103, 108.

selection of three commissioners and their terms of office shall be until the third Tuesday of the following November and there is a provision that a majority may in writing discontinue the voluntary district and thereafter "it shall be under such commissioners as is herein provided for other districts of this class."

These mutual districts are relatively unimportant for it requires unanimous consent of all land owners in an area to effect their organization; and in order to get their unanimous consent, the powers of the commissioners and of the district must usually be so restricted by the written agreement that adequate drainage improvements are made impossible.

The second general class of drainage districts, that in which a majority can coerce a minority, is far more common than any other type and is the only feasible kind of district for doing large scale drainage work.

Under the Levee Act there is only one form of organization for such a district, but under the Farm Drainage Act there are at least four different kinds of organization, namely:

1. Districts lying wholly in one town.
2. Districts lying wholly in two towns, called union districts.
3. Districts lying in three or more towns, in the same or different counties or in a county not under township organization or partly in a county under township organization and partly in a county not under township organization—commonly called special drainage districts.
4. User districts.

Under the Levee Act, all districts including a minority against their wish, are organized on a petition, setting forth the proposed name of the drainage district, the reason or necessity for the same, with a description of the proposed starting point, routes, and termini of the work, and a general description of the lands proposed to be included with the names of their owners when known, which petition must be signed by a majority of the adult land owners within the proposed district owning one-third in area of said land or one-third of the adult land owners who own a majority in area of said land. This petition is filed in the County Court of any county in which the greater part of the lands sought to be included in the district, lie.

When this petition is filed, the clerk of the County Court gives three weeks' notice of the filing of the petition by posting notices at the doors of the court houses of the counties in which the district is located and in ten places within the district and by publishing notices in the paper stating when and in what court the petition is filed; the starting point, route, termini, and general description of the proposed work; the boundaries and name of the proposed drainage district; and at what term of the court (or what particular day) the petitioners will ask for a hearing on the petition: and pro-

vision is made for notifying non-residents by mailing them a copy of the notice.

At the time stated in the notice the County Court hears the petition and determines just two matters: first, whether the petition is filed by the requisite majority of land owners; and second, whether the proposed drainage work is necessary or will be useful for the drainage of the lands named in the petition. If either of these matters is found against the petitioners, the petition is dismissed; but if the court finds in favor of the petitioners on these two matters, the court appoints three competent persons as commissioners not more than two of whom shall come from the same county if the proposed district lies in more than one county.

It will be well to stop and compare the organization procedure up to this point with the analogous provisions of the Farm Drainage Act.

In one-town districts, two-town districts, and special drainage districts, all under the Farm Drainage Act, the organization of the district is initiated by a similar petition signed by a majority in number of the owners of land who own one-third of the lands lying in the proposed district, or by one-third of the owners who own a major part of the land in the proposed district. The petition sets forth the boundaries of the proposed district and the lands in it that require a combined system of drainage or protection from wash or overflow, and states the desire of the petitioners that a drainage district may be organized to construct drainage improvements by assessment upon the property benefited.

The substance of this petition is the same for all these three kinds of farm drainage districts.

In one-town districts, the petition is filed with the town clerk and within five days thereafter, he gives notice in writing to the commissioner of highways of the town, of the filing of the petition (as the Farm Drainage Act provides that the commissioner of highways in one-town districts shall be the first drainage commissioner of all drainage districts in his town), and the clerk also posts three notices in public places in or near the proposed drainage district, that a meeting of the drainage commissioner (who is the highway commissioner) will be held at a stated place and not less than eight days nor more than fifteen days from the date of the notice for the purpose of organizing the drainage district.

At the meeting the drainage commissioner receives the petition from the town clerk and ascertains just one fact, namely: Whether the petition is signed by the requisite majority of land owners. If not, the petition is dismissed; if it is, the drainage commissioner takes further steps which will be later considered.

In two-town districts under the Farm Drainage Act, the petition is filed with the clerk of the town in which the greater part of the district lies and (since 1919, as there is only the highway commissioner in each town) the

clerk notifies the drainage commissioner (highway commissioner) of each of the two towns of the time when they shall meet at his office not less than eight days nor more than fifteen days from the date of the notice, and posts three notices of the time and place of the hearing just as in one-town districts. Then the same proceedings are had before the two drainage commissioners as were had before the single commissioner in one-town districts, except that the drainage commissioner of the town in which the larger part of the land in the proposed district lies has two votes to the other's one. At the first meeting the only question determined is whether the petition is signed by the requisite majority of the land owners.

In special drainage districts under the Farm Drainage Act, the petition is filed in the County Court of the county in which the greater part of the land in the district lies and must be accompanied by a bond signed by at least three responsible persons, conditioned for the payment of court costs and costs accruing to other parties in case the district is not established. The clerk of that court gives notice by posting notices in at least five public places in each township in which the proposed district lies, and also by publishing for three weeks a newspaper notice in the counties in which the district lies, which notice must contain a copy of the petition and state the day of the term of court when the petition will be heard. Provision is made for notifying non-residents. At the hearing before the court, only two questions are determined, (1) whether the petition is signed by the requisite majority of land owners and (2) whether the proper notice has been given. The hearing can be continued for proper notice, but if the court finds that the requisite majority has not signed, the petition is dismissed. If the court finds the petition is signed by the requisite majority it enters an order to that effect and appoints three drainage commissioners for the district.

Thus far, we have dealt with the requirements of the petition under both the Levee Act and the Farm Drainage Act and the variant steps up to the point where commissioners for the district are secured.

There is one more anomalous method of organization under the Farm Drainage Act for what are known as districts by user (Section 76 F. D. Act). That section provides that where several landowners have voluntarily (and without being organized into a drainage district) dug artificial ditches which are in need of repair and when they cannot agree about making the repairs, any one of such land owners can petition to have all of the lands which are connected by such drains organized into a farm drainage district. If these lands lie in one town, the petition is addressed to the drainage commissioner (highway commissioner) just as in one-town districts; if the proposed district lies in two towns, the petition is addressed to the two drainage commissioners of the towns; and if the proposed district lies in three or more towns, the petition is addressed to the County Court. The same notices are given as in other farm drainage districts, and at the first hearing, the tribunal

determines the jurisdictional facts (1) whether the lands described in the petition are connected by an artificial ditch voluntarily dug, and (2) whether the ditch is in need of repairs. The ditches must be artificial and land to be included in the proposed district must be physically connected by these artificial drains.¹ The description in the petition of these ditches must be so definite that a surveyor can locate them.² If the finding of the tribunal is in favor of the petitioners, the same steps as to appointment of commissioners by the court or the continuing action of the highway commissioners as drainage commissioners goes on precisely as in other farm drainage districts and hence the further steps in these user districts will not be specifically adverted to because they have the same powers and limitations as other farm drainage districts.³

Having now considered the steps in all kinds of districts up to the point where commissioners for the district are secured, we now go back to the Levee Act and take up the further proceedings of the commissioners.

Under the Levee Act, the commissioners after their appointment by the court take an oath (Section 6), elect one of their number chairman, and may elect another secretary (Section 7). A majority of the commissioners constitutes a quorum and a concurrence of a majority in any matter within their duties is sufficient (Section 8). The commissioners then examine all the land proposed in the petition to be drained and ascertain (1) if the drainage work proposed in the petition is properly planned, (2) the probable cost of all the work, (3) the probable annual cost of keeping it in repair after the work is completed, (4) the probable amount of damages to lands by reason of the work, (5) what lands will be benefited and whether the aggregate benefits will equal or exceed the cost of constructing the work, and (6) whether the proposed district includes all the lands that will be benefited or whether there are additional lands (describing them) which will be benefited by the work, and which ought to be included within the district. (There is a provision in the law for a report by the commissioners in case the petition calls for the repairing of drainage work "heretofore constructed under any law of this State," but such a petition refers to old work done under the unconstitutional drainage laws passed before the drainage amendment of 1878, and therefore has no present application and will be ignored.)

The commissioners reduce their findings to writing and report them to the court, and if they find that the cost of the work will exceed the benefits, the petition is dismissed at the cost of the petitioners, but if they find that the benefits will exceed the costs before reporting to the court, they are authorized to have the proper surveys, plats, specifications, etc., made showing specifically the work which should be done in the district. These plans may vary from the work proposed in the petition. The boundaries of the district

¹People v. Strandstra, 238 Ill. 341; Molohan v. Cashin, 258 Ill. 86.

²Peo. v. McDonald, 264 Ill. 514.

³Howard v. People, 126 Ill. 56.

during this stage may be enlarged to include other lands benefited by the work provided that this enlargement does not destroy the requisite majority of owners and area necessary to make the petition valid.

At the date of the appointment of the commissioners, the cause is continued to a day certain for filing their report, and further continuance from time to time may be granted by the court for the filing of their report. When the report is finally filed, all persons must take notice from the order of continuance, of the time of the hearing, and at this hearing, objections may be filed by any interested party to the plan of work recommended by the commissioners, or objections may be made by any interested party that the cost of the work will exceed the benefits. At the hearing, the court may refer the report back to the commissioners for changes in the plans, if the court thinks the same should be made or the plans can be changed at once on the hearing² When the court is finally satisfied that a feasible plan has been suggested and that the benefits will exceed the costs, it enters an order finding that the district should be organized, confirming the commissioners' report, finding that the petition, taking into account any annexed lands, still contains the requisite majority of land owners and naming the district. The form of this order is provided by the statute (Section 16). From this order an appeal can be taken to the Supreme Court.

In brief, under the Levee Act, after commissioners for the district are secured, they supply the court with information as to whether the cost will exceed the benefits, and if it does not, just what plans should be adopted to secure adequate drainage for the territory, and the court, acting on this information and all objections by the land owners, organizes the district.

It is impossible to go into the whole minutiae of these proceedings, but one or two general observations may be helpful in understanding the decisions of our Supreme Court. One is that the County Court exercises only a special statutory jurisdiction in forming drainage districts, and that no presumption in favor of its action is allowed. Its jurisdiction depends upon the filing of a proper petition and the record of the court itself must show that a proper petition was filed. This petition must conform strictly to the statute and if it does not, the order of the court establishing the district is a nullity.³ The orders of continuance must be entered by the court and observed, or the court will lose jurisdiction and the district cannot be organized when the petition is first presented.³ One drainage district cannot be organized to include land in another drainage district, except in the case of outlet districts under Section 65a of the Levee Act.⁴

Turning now to the Farm Drainage Act, in one- and two-town districts, after the meeting to receive the petition is held, the commissioners adjourn

¹People v. Darst, 285 Ill. 533.

²Drummer D. D. v. Roth, 244 Ill. 68; Aldridge v. Matthews, 256 Ill. 202; Peo. v. Swearingen, 273 Ill. 630; See Stokes v. Bay Bottoms D. D., 278 Ill. 390.

³Merkle v. Hathaway, 260 Ill. 186.

⁴Peo. v. Crews, 245 Ill. 318.

to a time not less than eight days nor more than fifteen days distant and announce the same at the meeting. In the meantime they go upon the lands described in the petition, hire an engineer if necessary, and determine whether additional lands should be included, or part of the lands described in the petition should be excluded (provided that such inclusion or exclusion does not destroy the requisite basic majority of petitioners) and at their adjourned meeting, if they find that the benefits will exceed the probable cost of the improvement, they enter an order in writing in a book kept by the town clerk, called the drainage record, organizing the district. There is a further provision that if two-thirds of the land owners owning more than one-half of the land in the district desire to form the district, even though the cost will exceed the benefits, the district may still be organized by the petitioners. But this provision has never come before the courts or been used so far as we know and is probably unconstitutional.

In special districts under the Farm Drainage Act, the commissioners appointed by the court may employ a civil engineer and make a report showing specifically the kind of work that should in their opinion be done in the district; and on the hearing, objections may be urged by any land owner and the court finds whether the cost will exceed the benefits. If it does, the whole petition is dismissed. If the court finds that the benefits exceed the cost, after hearing all objections to the plans of the improvement, the court organizes the district. There is a special provision in regard to organizing special districts that even if the cost exceeds the benefits, providing the majority in area of the owners of lands owning more than one-half the lands will desire the formation of the district, and evince such desire by not withdrawing their signatures from the petition, the court may organize the district; but as said before, this provision is of doubtful validity.

We have now reviewed the provisions of both the Levee Act and Farm Drainage Act from the appointment of the commissioners to the organization of the district. It will be noted that under both acts, the district is organized at an adjourned meeting and not at the first meeting, and this is essential to the validity of the organization.¹

Under both acts, the big question on which the organization of the district hinges is whether the probable cost will exceed the benefits. Under the Farm Drainage Act, the organizing tribunal does not seem to be required to determine whether the plans reported by the commissioners shall be the plans of the district for its initial work. The organizing order in the Levee Act does adopt those plans.

This would properly close a discussion of the statutory provisions relating to the organization of drainage districts, but there is one other matter that ought to be treated at this time. Under all of these acts, the drainage

¹Sanner v. D. D., 175 Ill. 575.

commissioners have power to enlarge or contract the boundaries proposed in the petition, and if the boundaries are enlarged by including other lands benefited by the proposed work, the same kind of notice must be given to such land owners as is given when the petition itself is filed before they can be included in the district when it is finally organized.

But even after the district is organized, it may develop when the drains are installed that other land, which has not been included within the district, is getting substantial benefit from the work of the district, or a still stronger case can be imagined where a land owner outside the district digs a ditch from his own land into the ditches of the district or runs his tile into the ditches of the district. Such a man gets all the benefit of being included in the district. Under the Levee Act (Section 58) as it now stands, if a man both connects his land and is benefited by the work of the district, he is deemed to have made voluntary application to be included in the district, and the commissioners can make a complaint in writing to the County Court setting up the facts and a hearing is had after a ten-days' notice in writing to the land owner; if the allegations of the petition are proved, the land is annexed to the district. The same proceedings may be had before a justice of the peace under the Levee Act, who sends a transcript of his judgment to the County Court. Under the Levee Act, if any owner of land outside the district petitions to have his land brought into the district, the commissioners may grant his petition and include his land if it is involved in the same system of drainage and requires for outlet the drains of the district. And Section 58a provides that a number of land owners outside the district on petition of as great a proportion of the land owners of the area to be added as required for an original district, can ask to have a new area involved in the same system of drainage attached to the district, which petition is heard by the commissioners only.

Under the Farm Drainage Act (Section 42) if individual land owners outside the district connect their lands artificially with the ditches of the district, they are deemed to have voluntarily applied to enter the district and without further notice their lands can be attached by the commissioners and assessed for their proportion of the original cost of the improvement, as well as for future work; and any land outside the district which is *either* benefited by *or* connected to the district can be annexed by the commissioners on giving notice and having a hearing on a petition made by the commissioners setting forth the facts in the County Court of the county where the district was organized.

All land legally annexed to drainage districts under any of the acts can be assessed for its part of the original cost of the improvement and is thereafter treated just like other land within the district.

This properly concludes all matters leading up to the formation of the drainage district, and its subsequent enlargement.

ADOPTION OF PLANS FOR WORK AND RAISING OF MONEY TO PAY
FOR THE SAME

The first step in all drainage districts after the district is organized is the adoption of a plan for drainage work which is usually suggested by a competent engineer. Both the Levee and the Farm Drainage Acts provide specifically that engineers may be employed for this purpose, and when plans are adopted and approved, the work of the district necessarily involves the taking of some property in the district for the use of the district. The taking of this land may be enforced by eminent domain proceedings because drainage work under these statutes is recognized as being a public use.¹ Provision is made in both acts that the commissioners shall if possible agree with the land owner upon a release of right of way and damages and compensation for landowner, and cannot be set off as a credit against the benefits which he must pay for an assessment.² Then the payment for the work is obtained by means of assessments against the lands benefited by the work. These general features are common to both acts, but the particular methods of working them are widely different.

Under the Levee Act, the plans and specifications for the work are adopted in the same order organizing the district, and therefore the district starts out with a definite initial plan of work. The first thing the commissioners do is to proceed to acquire the right of way and release of damages by agreement with the land owners as far as possible. They then make out an assessment roll in which they set down in proper columns the names of the owners of land in the district, with a description of their lands by tracts (thus prohibiting the assessing of two or more disconnected tracts together, but not limiting "tract" to the smallest legal subdivision), and in separate columns, their estimate of the damages to each tract if any by the work and in the other column the commissioners' estimate of the proportional part of the entire cost of the work as compared with the benefits that each tract will receive when the work is completed. To make this a little clearer, the assessment of benefits against each tract is arrived at by first considering what the total benefits to the entire district would be; then what the total benefits to each particular tract will be from the proposed work and then on the same ratio, dividing the estimated cost of the improvement so that each tract will bear its proportionate part of the cost.

Likewise the damages which are put in the "Damages" column may be damages that have been agreed upon by the land owners, or in case of failure to agree, the commissioners' estimate of what those damages are.

The entire assessment roll should produce a sum of money sufficient to pay the estimated cost of the work plus the damages and compensations for land taken. This commissioners' roll of assessments, or assessment roll, as it

¹C. C. C. & St. L. R. R. v. Pole Cat D. D., 213 Ill. 83.

²Payson v. Peo., 175 Ill. 267; Drainage Comrs. v. Volke, 163 Ill. 243.

is commonly called, is the claim of the commissioner on behalf of the district against the lands of each owner in the district. When this assessment roll is filed in the County Court, the clerk gives a ten days' notice by publication, mailing, and posting of notices of the time and place where a hearing will be held and at this hearing a jury is impanelled just like juries under the Eminent Domain Act. The proceeding is a separate proceeding as to each owner of land, but the assessment as to all the tracts and all the owners is heard in the one proceeding. The commissioners' roll of assessments makes a *prima facie* case for the drainage district and the burden of proof that it is erroneous in its estimates, at least as to benefits, rests upon the objecting land owners.¹ After all the evidence is heard and the arguments of counsel are heard, the court instructs the jury as to what are drainage benefits and damages for which an assessment can be levied and on the request of any land owner, the jury go out and view the lands of the objectors. If no objections are made, the assessment roll can be confirmed by the court. When objections are made and the jury view the lands, they set down their estimate of the benefits and damages to each tract in the same form (which may be furnished them by the court) that the commissioners have used and which is known as the verdict of the jury. The jury have the right to raise the assessment on lands not objecting and to lower the assessment on objecting lands or vice versa,² but their verdict should produce the total amount of assessment authorized by the court, unless the doing of this would spread assessments against any tracts larger than the total benefit to any tract. The fundamental principle of assessments is that no assessment against any tract should exceed the total amount of benefits to that tract under any circumstances and the assessments against each tract should be strictly in proportion to the benefits derived by that tract as compared with the total benefits to the district.

The jury's verdict is made by them and put in shape by their clerk elected from and by the jury itself when it first retires to consider its verdict, and the jury may be assisted by the court in the presence of the jury or recalled after being discharged to correct any errors or omissions in the verdict (Section 17b). This verdict is then confirmed by the court and appeals are allowed to the Supreme Court by any one or more land owners. The reversal on appeal as to any one or more tracts appealing does not affect the assessment against the others.

Provision is made that the assessment can be made payable in installments, and that bonds up to 90 per cent of the assessment can be issued under the order of the court. Such in general is the method of planning the original work and providing money to pay for it under the Levee Act.

Under the Farm Drainage Act in one- and two-town districts, after

¹Lovell v. Sny Island D. D., 159 Ill. 188; Sny Island D. D. v. Shaw, 252 Ill. 142.

²Little Beaver D. D. v. Livingston, 270 Ill. 582.

the first commissioners have organized the district, the next step is to elect drainage commissioners on the second Saturday of March thereafter, in an election called by the town clerk. Three commissioners are elected at the first election, one to serve for one year, one for two years, and one for three years, and annual elections are held thereafter to elect one commissioner a year. Every adult land owner in the district has a vote and any land owner residing in the district is eligible to the office of commissioner.

These elected commissioners then go upon the land and determine upon a system of drainage with the assistance of an engineer, if needed, and they make a report in writing with maps, profiles, and estimate of cost of the work which is filed in the clerk's office and recorded in the drainage record (Section 15 to 17). These commissioners then proceed to secure release of right of way as far as possible by agreement and when they cannot agree upon the damages and compensation for land taken, they file a petition in writing with a justice of the peace asking him to issue a venire for a jury to assess damages, in which proceedings, service is obtained upon the land owner as in other such cases before a justice of the peace, and a hearing is had before the jurymen who go out and look at the land if necessary and return separate verdicts as to each owner of land. This is like the simple eminent domain justice of the peace jury used in laying out highways. The verdict of this drainage jury is final and conclusive and no appeal is allowed from it.¹ It will be noted that this jury has nothing to do with the matter of assessing benefits, but simply determines damages and compensation for land taken.

The next step is the assessment of benefits against each tract. This is done in all farm drainage districts by the commissioners making what is known as a classification of all lands in the district on a scale of one hundred. The tracts which will receive most and about equal benefits are marked at 100 and those that the commissioners think will receive less benefits are marked at a less number denoting their per cent of benefit. In other words, a proportionate scale is arrived at in the beginning on a percentage basis. This classification is subject to change afterwards if the commissioners find from experience and results that it is not fairly adjusted on the lands.

When the classification is made by the commissioners, notice is given to the land owners by two weeks' publication in a newspaper and by posting ten copies of the notice in the district, stating the time and place where the commissioners will meet and hear objections from the land owners to the classifications. At this hearing, the classification may be changed as to any tract by the commissioners or it may be confirmed as it is and any person who appeared at the classification meeting and urged objections can appeal to the County Court on giving bond. The appeal is heard there by a jury,

¹Dr. Commrs. v. Harms, 238 Ill. 415.

but the jury on the classification appeal cannot raise the classification on any tract unless objection was made below that the classification was too low, and cannot consider any classifications except those to which objection was made on the hearing before the commissioners.¹ When the classification list is finally confirmed, either with or without appeal, it establishes the ratio thereafter for the levying of assessments. In farm drainage districts, the making of the classification is the all-important part of the assessment, for thereafter the commissioners meet without notice to the land owners and determine the amount of money needed to pay for the work and apportion it among the landowners on the basis of classification.²

As indicated in the preceding paragraph, the commissioners next make up a tax list, and apportion among the land owners on the basis of classification, the amount of the assessment needed to construct the work. They determine this amount by a mere resolution entered in the drainage record reciting that they need so much money to be raised by special assessment upon the lands of the district benefited. No notice is given to the land owners and they must keep in touch with the drainage records. An appeal is allowed from this assessment on the single question as to whether the total benefits to each tract will be less than the amount of the assessment, and this is heard in the County Court before a jury. This assessment becomes a lien on the lands in the district when a copy of the tax list is filed for record in the office of the recorder of deeds in the county or counties in which the land lies.

The assessment may be made payable in installments and bonds may be issued. Bonds of these one- and two-town districts are not very salable and are not often issued.

So far we have considered the plans for work in assessment proceedings under the Levee Act and under one- and two-town districts under the Farm Drainage Act. There yet remains consideration of the same matters in special districts under the Farm Drainage Act. After the special district is organized, if it contains fifteen or more landowners, the county clerk gives notices of an election to elect three drainage commissioners at some place within the district or at the county clerk's office. The qualifications for voting and for holding office as commissioners are the same as obtain in one- and two-town districts, and the term of office is also the same, except that the annual election in special districts takes place on the third Tuesday in November.

In special districts containing less than fifteen land owners the County Court appoints the commissioners and fills vacancies annually thereafter on the last day of the December term of court, each commissioner serving for a term of three years.

In special districts, the commissioners go upon the land and with the

¹People v. Green, 242 Ill. 455.

²Peo. v. Schwank, 237 Ill. 40; Peo. v. C. & I. T. Co., 267 Ill. 510.

assistance of an engineer prepare plans and specifications for the work and secure the releases for right of way by agreement, the same as in all other districts which we have thus far considered. When releases of damage and right of way cannot be secured by agreement, these matters are adjudicated before an eminent domain jury in the County Court after service of process, and there is no provision expressly allowing an appeal or making the action of that jury final.

When all cases of damages are out of the way, classification is made by the commissioners of special districts just as in the other farm drainage districts, and after the classification, the commissioners make an assessment just as in other farm drainage districts, except that they also make out a certificate stating the amount required by them to be levied as a special assessment, which is filed with the clerk, and he computes and apportions the amount thus levied among the lands in the district according to the classification. A copy of this tax list is filed for record in the office of the recorders of counties other than the county in which the district was organized. Except for the matter of the certificate of levy, as it is called, the assessment proceedings are substantially the same as in the one- and two-town districts.

We have now considered proceedings in all the different kinds of districts down through the levying of the assessments. This section can properly be closed by consideration at this point of the provisions for collecting the assessments in case they are not paid voluntarily by the land owner.

Under the Levee Act, the assessments become a lien and draw interest at six per cent from the time of confirmation until paid and the treasurer of the drainage district who is appointed by the commissioners and who gives bond, enters in his treasurer's record book the amount of principal and interest due from each land owner on each installment. When the verdict of the jury has been filed and confirmed, a certified copy of the assessment roll is made by the clerk of the court and sent to the treasurer of the drainage district who publishes a notice for three weeks in the paper that the assessment is due. If the assessment is not paid by March 10th thereafter, the drainage treasurer returns a delinquent list showing the names of the land owners, a description of their lands and the amount delinquent, to the collector of taxes of the county in which the land lies, and he puts these delinquent amounts on his tax records and collects them with the other taxes. If they are not paid to the tax collector, he applies for judgment against the lands in June just as in the case of any other taxes.

It would take too long to go into the nice distinctions that are made as to what objections can be urged on the application of the tax collector for a judgment for delinquent drainage assessments. This general statement is true as to assessments under the Levee Act in that connection. An objection to a drainage assessment in tax proceedings is a collateral attack upon the judgment of the County Court confirming the assessment and if the County

Court had jurisdiction of the subject matter and of the person of the objector, mere errors in its judgment cannot be raised as an objection to the tax proceedings. Thus no objection can be made that the amount of the assessment is greater than the benefits to the land, or that it is out of proportion to other assessments. No objections to the kind and character of the work to be done in the district can be offered on tax objections under the Levee Act, and an attack upon the validity of the organization of the district, which does not go to the jurisdiction of the court, cannot be raised.¹

But if in the assessment proceedings or in the proceedings organizing the district a land owner was not properly notified of the proceedings and did not appear and object to them and the court therefore had no jurisdiction over his person, he may come in on tax objections and object to the assessment and defeat it.²

Under the Farm Drainage Act, the commissioners by their resolution fix the time when the assessment shall be due and if no time is fixed, it becomes due thirty days after confirmation and draws interest until it is paid. The commissioners then file a copy of their tax list with the treasurer (who is the supervisor of the town usually) and who executes bond. He keeps the record of the assessments and although no provision is made by law for notice to the land owners of the amount of their assessment, it is customary for the treasurer to mail a notice to each land owner. If the assessments are not paid by March 10th following, a delinquent list is sent to the tax collector and the same proceedings are had as in the case of other delinquent taxes. In special districts, the county treasurer is the treasurer of the drainage district.

Under the Farm Drainage Act, there is an important difference in the questions that can be raised on application for judgment for delinquent drainage assessments. Since the entire matter of assessment in farm drainage districts is heard before the drainage commissioners and not before a court, and since probably there is no notice of the making of the assessment, from which an appeal is allowed to the County Court (although this last question has not yet been passed on by the courts), our Supreme Court has held that on application of the collector for judgment, any land owner can show that his land has been assessed more than it will be benefited by the work. The question of the proportion of benefits is not open because notice of the classification hearing is given to the land owners and an appeal is allowed to the County Court. But the question of whether total benefits are less than the assessment is open to him.³ Moreover many mere irregularities in doing the work of the district for which money has been expended and for which an assessment has been levied can be raised on tax objections in the farm drainage districts. For instance, that the assessment is levied to pay for

¹*Peo. v. Boyd*, 256 Ill. 9; *Osborn v. People*, 103 Ill. 224.

²*Payson v. Peo.*, 175 Ill. 267.

³*See People v. Carr*, 231 Ill. 502; *People v. Garner*, 267 Ill. 396.

work let out on a contract without proper notice (as hereafter explained) defeats the assessment¹ and it is a good tax objection that the assessment was levied to pay for an indebtedness incurred before levying the assessment.² If the meeting to make the classification was held outside of the drainage district, or if the assessment meeting was held outside the drainage district, as well as outside the town clerk's office, the assessment is void and can be attacked in tax proceedings. Many other matters which it would take too long to detail can be raised at this stage which is sometimes more than a year after the assessment has been levied and after the work has been done on the faith of it. Later some of these other matters will be pointed out and their disadvantages will be discussed.

CONSTRUCTION OF WORK

We have now considered drainage districts from their formation down through the planning of the work and the provisions for getting the money to pay for the same, and are now ready to take up the actual method of building the drainage improvements. They will be discussed under three heads:

1. Contracts for the work.
2. Providing additional funds or additional assessments.
3. Change in original plans.

1. CONTRACTS FOR THE WORK

Under the Levee Act (Section 36) the commissioners may at any time make contracts for surveying and making additional plans, but as in the Farm Drainage Acts, all contracts involving over five hundred dollars must be let only after notice is published in a newspaper, stating the time and place, when and where sealed bids will be opened, and stating the kind of work to be let and the terms of payment. The commissioners may continue the letting and reject any or all bids. Commissioners are prohibited from being interested in any contract.

Under the Farm Drainage Act (Section 35) twenty days' notice in a newspaper is required when the work costs over five hundred dollars and the bidding is let by sealed bid. The commissioners can not be interested during their term of office in any contract, and provision is made that if any landowner in the district assessed, contracts to do any work and the work is done according to the contract the commissioners may credit the amount of assessment due from him with the work performed by him. Compensation for right of way taken must be paid in cash but damages to land not taken can be offset against the assessment.

There is one important limitation not stated expressly in the statute but read into it by construction by the Supreme Court and that is that no con-

¹Rogne v. People, 224 Ill. 449.

²People v. Kuns, 248 Ill. 42.

tract can be let for the work of constructing the drainage improvement for an amount in excess of the assessments then levied to pay for it. In other words, an indebtedness for the construction of the work of the drainage district can not be created in advance and an assessment afterwards levied to pay for it.¹ And this probably remains true even under the 1915 amendment to Section 37 of the Levee Act providing that an additional assessment can be levied to pay obligations incurred for the completion of any part of the work of the district as originally planned and contracted for and already begun within any drainage district. That amendment refers to a case where the district at the time the contract was let had sufficient funds levied and not then used to pay for the work but thereafter because part of this money was used for other legitimate purposes not enough was left to pay for the completion of the work and in such case that amendment was passed to make clear that the contractor could go ahead and complete his contract and compel the levying of an additional assessment to pay for the balance due him. Before this amendment, according to the dicta of the Supreme Court, whenever the funds on hand in a drainage district were exhausted all work on contracts had to stop.²

The contracts for the construction of drainage improvements must be differentiated from contracts covering what are loosely called the current expenses of a drainage district. These current expenses or running expenses include the court costs in levying assessments, the payment of commissioners' fees and of attorneys' fees and even the having of plans and maps made for additional work needed. Indebtedness for these current expenses can be incurred even when there are no funds on hand to pay for the same. The exception is carved out in their case because of the inherent necessity of the situation. When the district runs out of funds, if the commissioners were without power to contract for the services of attorneys or if the commissioners could receive no compensation for their time in preparing to levy an additional assessment or if engineers could not be hired to make plans for new work for which additional assessment was to be levied, the whole purpose of the law would be defeated. So much for the question of contracts.

2. ADDITIONAL ASSESSMENTS

It very often happens that the first assessment in a district is insufficient to pay for all of the expenses that the district has to incur. Lawsuits arise which must be compromised, freight rates increase, or the price of material goes up, and in such case more money must be raised by assessment. Under the Levee Act (Section 37) either on petition of a majority of the land owners owning one-third in area of the land, etc., or the converse majority, or on petition of the commissioners of the district without any action by the land owners, accompanied in the latter case by a verified statement of their

¹Winkleman v. Dr. D., 170 Ill. 27.

²Spring Creek Drainage District v. E. J. & E. Ry. Co., 249 Ill. 260.

receipts and expenditures and showing in either case that the original amount assessed has been inadequate to complete the work as originally planned or that other new and additional work needs to be done in the district or that money is needed to pay for current expenses that have accrued, or is needed for other lawful purposes, the court causes a two weeks' notice of the hearing on this petition to be given and at this hearing the court determines whether any more money should be raised and for what purposes, and orders an assessment levied. The commissioners then make out an assessment roll and the same proceedings are had as in the case of the original assessments in levee districts.

Under the Farm Drainage Act in all three classes of districts, if the commissioners find that the assessment levied will be inadequate to complete the proposed work, they may make additional levies upon the old classification without any further notice. And in case any new or additional work is to be done, they may make an additional assessment upon the old classification if it fairly adjusts the benefits from the new work. But the dicta of the court are to the effect that whenever new work is to be done a new classification is to be made.¹

No notice is given to the land owners under the Farm Drainage Act but an appeal from the assessment will lie. The matter of whether an additional assessment can be levied under the Farm Drainage Act to pay current expenses does not seem to have come before the courts, but on principle they should have implied authority to do so. This ought to be made clear by express enactment.

Additional assessments are subject to the fundamental limitation that they must not exceed the benefits to the land from the improvement and in determining whether land has paid for all the benefits it will receive, the original and all other assessments should be added together with the additional assessment and compared with the total benefits to each tract from the work in the district.² But on an additional assessment hearing former assessments cannot be considered to adjust inequalities in the proportionate distribution of former assessments.³

3. CHANGE IN ORIGINAL PLANS

Not only do the original calculations of the commissioners as to the amount of money needed often prove erroneous, but the original plans confirmed by the court often prove inadequate to give complete drainage to a district. In all districts, under both acts, the duty resting upon the drainage commissioners to afford main outlets of ample capacity to drain the district, is mandatory and it is no defense to the commissioners in an action of man-

¹People v. McDougal, 205 Ill. 637; Reynolds v. Milk Grove Dr. D., 134 Ill. 268.

²Dr. Comrs. v. Kelsey, 120 Ill. 482.

³Lovell v. Sny Island Dr. D., 159 Ill. 188; Freeson v. Scott County Comrs., 283 Ill. 536.

damus to compel them to construct adequate drains, that the drains asked for were not included in the original plans and specifications approved by the court at organization.¹

Under the Levee Act (Section 37 and Section 44a) the commissioners are expressly authorized to change the original plans with the consent of the court and to provide for new and additional work in drainage districts and levy assessments to pay for the same. The assessments for this new and additional work, however, should be apportioned among the land owners on the benefits to be derived from the new and additional work, leaving out of consideration entirely the old work originally done in the drainage district²

We are now discussing the question of the construction of new work, not the maintenance of the old work. Under the Farm Drainage Act (Section 41) the express mandatory duty is imposed upon commissioners to provide main outlets of ample capacity for the water of a district including future needs as well as the present, and under Section 41 the commissioners are empowered, in case they find that there has been an error in locating or constructing the ditches or that for other causes lands are not drained or protected as contemplated, to use the corporate funds of the district to carry out the original purpose to afford all lands complete drainage as far as practicable.

Under both acts, they are authorized to go outside and below the districts to provide an outlet and are given powers of eminent domain for that purpose. There is no particular difference in the powers of the two districts in this respect. The differences in the acts relate mainly to the method of raising the money to pay for the same.

MAINTENANCE

We have considered thus far the provisions of the law relating to the organization of districts and to all steps through the original construction of the new work. The next step is the matter of maintenance of drainage improvements after they have been originally constructed.

Under the Levee Act elaborate provisions are made at the outset for keeping up the work after it is constructed. Before the district is organized, the commissioners are required to report the probable annual cost of keeping the improvement in repair after the work is completed (Section 9). At the time of the first assessment the court may direct the commissioners to make an assessment of the annual amount of benefits which each tract will sustain by keeping the levees, ditches and other work in repair and to maintain in operation pumping plants if there are any in the district (Section 17), and the first assessment jury in their verdict may find the annual amount of benefits which the land will sustain by keeping the work in repair. Section 17½ provides that the annual amount for keeping said levee or ditch in

¹Binder v. Langhorst, 234 Ill. 583; Peotone Dr. D. v. Adams, 163 Ill. 428.

²Inlet Drainage District v. Anderson, 257 Ill. 214.

repair, shall not in the aggregate, amount to a sum in any one year, greater than would be produced by thirty cents per acre on all lands within said district, but there is no limitation on the amount of annual benefits which can be assessed to pay for keeping a pumping plant in repair except the fundamental limitation that it must not exceed total benefits to the land.

Section 26½ provides that the annual amount of benefits for keeping the work in repair shall be due and payable on September 1st annually and shall be a lien on the lands from and after the confirmation of the report. The commissioners are required to report on the condition of the work at the July Term of the County Court and submit their estimate of the amount necessary to keep the work in repair and pay incidental expenses for the ensuing year together with any estimated expense for completing any work, and the court enters an order without notice to the land owners after hearing this report, fixing the amount of the annual benefits for the ensuing year, which are collected just like any other drainage assessment. If thirty cents per acre is not needed, the amount is scaled down but the assessment for any one year cannot go over that amount except as before stated for pumping plants. If the commissioners run out of money because of an insufficient estimate of annual benefits and if the court has remitted some part of the full assessment of annual benefits originally levied, the commissioners may borrow on anticipation warrants against the next year's assessment of annual benefits.

No provision seems to be made anywhere for determining when the amounts of these annual benefits added together exceed the total benefits from the work unless that question is determined when the jury fixed the amount at the time of the assessment.

If the amount of annual benefits is not made at the time of the original assessment it can be made at any time thereafter under Section 37. If this levy of annual benefits is intelligently made, the expensive procedure entailed by additional assessments can be avoided.

Turning now to the Farm Drainage Act, the provisions for maintenance are found under Section 41 which apparently applies to all kinds of districts under that act, and Section 70 which applies only to special districts. Section 41 provides that after the completion of the work, the commissioners shall keep the same in repair and that if sufficient funds are not on hand the commissioners shall make a new tax levy. This work is done on the old classification unless the commissioners find that the old classification is not properly adjusted when they make a new one. It is merely a matter of the passing of a resolution by the commissioners, but is subject to the danger that in tax proceedings the court may decide that the benefits have all been previously paid for and that thereafter against a particular piece of land it must cease.

Section 70 applying to Farm Drainage Districts provides that the commissioners on or before December first of each year shall file a statement of

the evidences of indebtedness outstanding with other data in relation thereto and the amount necessary to be levied on the lands to keep the work of any part thereof in repair for the year next ensuing together with certain other matters not connected with maintenance and the clerk of the district then spreads an assessment on the old classification and certifies a copy of it to the county clerks of other counties in which the district may embrace land, and the assessment is collected just like other assessments in special farm drainage districts. Attention is called to the fact that under Section 70 the certificate of levy provided for, includes several distinct kinds of items and these must be certified separately and not in a lump sum or else the whole will be void.¹

The question has never yet arisen so far as we can find whether when the aggregate of all assessments equals or exceeds the benefits to land, an assessment can thereafter be levied for maintenance of the ditch, but as the authority of all drainage districts to levy assessments is limited by the Constitution to benefits conferred by them it would seem that an assessment even for maintenance could not be levied in such a case.

ABANDONMENT AND DISSOLUTION OF DRAINAGE DISTRICT

A drainage district does not forfeit its corporate powers by a mere non-use of them. It remains a district, a quasi-municipal corporation, even though no commissioners are chosen for many years, until dissolved by order of court in *quo warranto* or by operation of the statute.²

Both the Farm Drainage Act and the Levee Act contain separate provisions providing for the dissolution of districts organized under those respective acts only, and in addition to these provisions there is an independent act approved June 4, 1889, in force July 1, 1889, providing for dissolution of districts organized under any act. This independent act provides that upon a verified petition praying such dissolution signed by not less than four-fifths of the adult landowners of the district who own in the aggregate not less than three-fourths of the area of the assessed land thereof, after six weeks' notice by publication and posting, and on a showing that no indebtedness of the district exists, can be dissolved by the County Court of the county where the district was organized. The drainage improvements of dissolved districts remain for common use of the landowners, and the other property of the district, if there is any, is sold by the order of the County Court directed to the master-in-chancery of the county, and the proceeds of sale after the payment of costs are turned over to the county treasurer to pay any indebtedness and (inferentially) to rebate the balance among the landowners in proportion to the last assessment.

Under the Levee Act (Section 44 as amended in 1919) provision is first

¹Peo. v. Glenn, 207 Ill. 50; Peo. v. Garner, 267 Ill. 396; Peo. v. Peeples, 291 Ill. 537.

²People v. Niebrugge, 244 Ill. 82.

made on a petition of a majority of the landowners representing one-third of the area for the County Court, to order the commissioners to abandon particular drains or ditches within the district before the contract for them is let, and, if assessments have already been levied, to rebate the equitable part of such assessment rendered unnecessary by the abandonment of the particular drains.

Then the section provides that at any time before the contract for the construction of the work has been made, a majority in number of the landowners owning more than one-half in area of the lands in the district may petition the court to abandon the whole system of work and abolish the district and thereupon "the court shall enter upon its record an order granting the prayer of such petition upon condition that the petitioner pay all court costs within thirty days from the rendition of such order." If the costs are not paid within thirty days the order is of no force and effect. If the district is abolished under this section, assessments are refunded to the persons who paid them. It will be noted that it is not a condition precedent to the dissolution of a district under this act that the petitioners should be required to pay anything except court costs which do not include attorneys' fees, commissioners' fees, engineers' expenses and other current expenses of the district, which might be very considerable and might well be incurred after the organization of the district and before the letting of a contract for work. In the case of *Deneen v. Deneen*, 293 Ill. 454, the Supreme Court held that this section did not apply to districts organized before July 1, 1919, but left the question open as to whether the law was constitutional if attempted to be applied to districts organized after that time.

Under the Farm Drainage Act (Section 47½) whenever two-thirds of the owners of the land owning not less than two-thirds of all the lands within any district lying wholly within the limits of a single town, shall present a petition to the commissioners asking that the organization shall be dissolved and showing the debts have all been paid and that no litigation is pending against the district, the commissioners shall endorse upon the petition an order dissolving the district, which is filed in the office of the town clerk and by him recorded in the drainage record, and the district is then dissolved with a proviso that within a year the same number of landowners may petition to have the district restored and if such petition is made and entered upon the drainage record, the district is again restored. No provision seems to be made in the Farm Drainage Act for the dissolution of two-town or union districts and special drainage districts, which therefore can only be dissolved under the Independent Act of 1889.

MISCELLANEOUS POWERS: DUTIES AND SUCCESSION OF COMMISSIONERS

In the above statement of the various statutory steps in organizing a district, raising money, planning and building drainage improvements, maintain-

ing them, and dissolving the district, we have necessarily omitted a great many important doctrines in regard to the powers of drainage districts and of commissioners which will be here grouped in separate discussions applying first to the Levee Act and then to the Farm Drainage Act.

Before the constitutional amendment of 1878 (Article IV, Section 31) was passed, the Supreme Court in the case of *Updike v. Wright*, 81 Ill. 49, held that there was no legislative power to organize a drainage district which could build or maintain levees or which could raise funds by special assessment under the act of 1871. A number of drainage districts had been formed under this act and had done considerable work and after the constitutional amendment when the Levee Act was passed, frequent references were made and are still found in that act to drains or ditches "heretofore constructed under any law of this State." These references and the special procedure in reference to such districts all relate to these old illegal districts.

The proceedings of the commissioners under the Levee Act are kept in a book called the drainage record. But inasmuch as most of the proceedings in Levee Act districts are matters of record in the courts, the keeping and the contents of this drainage record are not so important as the keeping of records in Farm Drainage Districts (Section 47).

The commissioners in Levee Act Districts hold meetings on the first Tuesday of March, May, July, and September of each year or oftener, if necessary, and they are required to make brief memoranda in the drainage record of all their transactions concerning the district. They are required to keep a record of the bonds that have been issued and sold, showing whether they are a lien upon any particular installment of assessments or a general lien on all; what contracts have been let on any section or division of the work; all orders issued on the treasurer; all material or tools purchased; warrants for services of a commissioner issued by the clerk; all sums paid by order for work done; and in general they are required to keep an accurate and complete account of their financial dealings on behalf of the district.

Under Section 41 the commissioners are required to report as often as once a year to the County Court the amount of money collected by them and the manner in which it has been spent and upon filing the report the court sets a time not exceeding three weeks from the filing when the report is heard and the commissioners must give ten days' notice of the hearing by placing notices in four public places in the district and one on the door of the court house, and the court on hearing may require evidence from the commissioners that the report is correct, although the Supreme Court has held that when objections are made to the report it shall be taken as *prima facie* correct and the burden of proof rests upon the objector.¹

Commissioners under the Levee Act may hold all meetings any place in the county or counties in which the district is located and they are paid three

¹Hunt, *Drainage District v. Cole*, 283 Ill. 105.

dollars a day and their necessary expenses for each day actually engaged in official duties, and in districts having an area of more than seventy-five thousand acres, commissioners receive four dollars a day and their expenses. They report to the court their claims for compensation and only when this report is approved by the court and certified to the drainage treasurer can they draw an order on the treasurer for their compensation (Section 42).

Under the Levee Act drainage commissioners are never elected except in mutual districts. The County Court on the first Monday in September after the district is organized appoints three commissioners, one to serve for one year, one for two years, and one for three years, and on the first of September of each year after this, the court appoints a successor to the man whose term has expired. The landowners representing a majority of the acreage embraced in the district may petition for any such successor and the court is bound to appoint such nominee if the petition is filed on or before September first. In case the petition is not filed, the court within ten days after September first appoints any suitable person as commissioner of the district and provision is made that after all the drainage improvement work as originally constructed for which the district is organized, the court may on petition of the majority of the landowners dispense with two commissioners and appoint but one commissioner to act for the district until additional work is needed to be done in the district when the old three-commissioner system is restored (Section 62). The court may remove any commissioner appointed by it and appoint another in his place or fill any vacancy (Section 40).

Each commissioner must give bond in a sum not less than twice the amount of assessments of benefits payable in any one year or that may come into their hands and control during one year, with security to be approved by the court (Section 32).

Section 63 provides for a special oath by commissioners to make assessments, but this is repealed by implication when assessments are made by an eminent domain jury as is now the case instead of by the commissioners as under the old law of 1885 which was held unconstitutional.¹

By Section 50 commissioners are made personally liable for all damages sustained by any party aggrieved by failure of the commissioners to perform their duties and the Supreme Court has held that a willful failure to adopt plans to secure adequate drainage and to levy an additional assessment for this purpose makes the commissioners personally liable for the damages occasioned thereby.²

Under Section 65a of the Levee Act, provision is now made for organization of what are called outlet districts. They are districts organized to improve a stream or river which constitutes the common outlet for two or more drainage districts as well as other land and they are organized on the

¹See *Hillview D. D. v. Doudall*, 276 Ill. 33.

²*Binder v. Langhorst*, 234 Ill. 583.

same kind of petition and with the same kind of procedure as other Levee Act districts. They possess the power not given to other drainage districts of including other drainage districts within the boundaries of the outlet district and with the privilege of assessing other drainage districts for benefits conferred by deepening and straightening the outlet stream.

Under the Farm Drainage Act, we have already pointed out that the commissioners are elected by the land owners soon after the organization of the district in all kinds of districts, and that from that time on, election is the means of filling vacancies in the board of commissioners. The Farm Drainage Act does not contain so many provisions defining the powers and duties of the commissioners as does the Levee Act. We have already mentioned the duty resting upon Farm Drainage commissioners to afford main outlets of ample capacity to drain the district whenever this is practicable, and undoubtedly their commissioners would be personally liable for willful failure to regard this duty. Under the Farm Drainage Act (Section 73), the commissioners receive three dollars a day for the time actually employed in their official duties and they make out their account under oath, which in all districts except special drainage districts is audited and allowed by the board of auditors of the town in which the district was organized, and in special districts their account is presented to and allowed by the judge of the county in which the district was organized. The clerk received the same fee as is allowed for like services in matters connected with his office, and the treasurer (who in one- and two-town districts is the supervisor, and in special districts is the county treasurer) receives a sum to be fixed by the commissioners not to exceed 2 per cent of money collected by him and to exceed 1 per cent on moneys paid by other collectors or treasurer and in no case to exceed \$500.00 a year for his services.

The Farm Drainage Act contains a specific provision that farm bridges shall be erected by the district whenever a ditch goes through a field and there is no corresponding provision in the Levee Act.¹

The Supreme Court, by construction, held that all meetings in one- and two-town districts must be held within the boundaries of the drainage district and after the amendment of Section 2 in 1915, meetings in these districts could also be held at the office of the clerk of the drainage district. The classification on an assessment or a meeting to organize held elsewhere makes all the proceedings at that meeting utterly null and void, and the collection of the assessment can be defeated on tax proceedings because of this.²

In special districts, meetings can be held anywhere in the county.³

In farm drainage districts, especially in one- and two-town districts the drainage record kept by the clerk is very important, as it is the only legal evidence of what the commissioners have ordered done and when the drainage

¹McCaleb v. Coon River D. D., 190 Ill. 549.

²Peo. v. Carr, 231 Ill. 502; Peo. v. Camp, 243 Ill. 154.

³Lake Fork D. D. v. Highway Comrs., 292 Ill. 340.

record is silent, no presumptions are indulged as to what took place. It cannot be supplemented, contradicted nor added to by parol,¹ except that recitals in the drainage record, showing that the commissioners had jurisdiction over the persons or of the subject matter to make classification, can be contradicted.² The drainage record must show the receipts and disbursements of money and must show that in the letting of contracts the law was complied with. It can be determined at any time to show the true facts, but the facts must be shown by the record.³

Under Section 15b, orders must be drawn by the chairman and clerk and it is not sufficient that all three commissioners sign the order if not done in the above capacities,⁴ but Section 15b was repealed in 1919.

Sections 4 to 10 of the Farm Drainage Act simply codify the law of natural drainage, giving an upper land owner the right to drain his land across the lower land below him when such is the natural condition of things. These sections also provide that when it is necessary for one land owner to extend drains from his lands across the lands of another to obtain a proper outlet, as for instance when an upper land owner desires to lay a tile drain through the land of another owner below him, he can go into a justice court and have the damages first ascertained and then can enter upon the land of the lower owner and construct the drain.

Provisions are found in both acts penalizing willful injuries to drains (Section 44, F. D. Act; Section 66 Levee Act).

Reference should be made to the provisions of both of them allowing a lower drainage district to collect damages from an upper district or rather to assess the upper district for benefits conferred by the lower district in making an outlet for the higher lands. In the absence of a statute imposing liability, the upper and dominant district is not liable to the lower and servient district for connecting its ditches with the ditches of the lower district.⁵ In 1913, an independent act was passed applying to all drainage districts under both acts, allowing such a recovery. By Section 3 of this Act, the commissioners are empowered to enter into a contract to settle the amount to be paid by each of the districts for the construction of the work in the lower district which will benefit the upper district, which contract is subject to the approval of the County Court, after published notice given for two weeks to people in the district. Where an agreement cannot be reached, the commissioners of the lower district can bring a common law action against the upper district in the County Court of the county where the upper district was organized, and the court in that action settles the amount of compensation.

Under the Farm Drainage Act (Section 41) if an upper district in order to obtain a proper outlet goes below it into the lands of another organized

¹Peo. v. Carr, 231 Ill. 502; Peo. v. Adair, 247 Ill. 398; Peo. v. Kuns, 248 Ill. 42.

²Peo. v. Graham, 280 Ill. 303.

³Peo. v. Zellar, 224 Ill. 408.

⁴Peo. v. Wylie, 283 Ill. 515.

⁵D. D. v. D. D., 130 Ill. 261.

district and improves a natural or artificial channel there in such a way as to benefit the lower district, the lower district can be compelled to pay to the upper district the amount of benefits conferred and if an agreement cannot be reached, the commissioners of the upper district can bring a suit in the name of the people of the district against the commissioners of the lower district in the Circuit Court of the county where such drainage district is organized.

Reference should also be made to the provisions of the two acts relating to the formation of sub-districts. The function of a sub-district is to provide for a sort of drainage district within a drainage district; to construct minute and particular drainage for particular areas within the district, using the main ditches constructed by the entire districts as outlets. Sub-districts are not independent corporations but are mere administrative units or sub-divisions of the main district.¹ Section 59 of the Levee Act provides that any district which maintains a levee as part of its work, which contains lands in particular localities within the drainage district in need of more minute and complete drainage, such localities can be organized into sub-districts either on petition of the same requisite majorities required in case of the organization of main district or on petition of the commissioners of the main district to the County Court, with the three weeks' notice to all land owners in the proposed sub-district and a hearing in the County Court similar to the hearing in the main district to organize it. After the sub-district is organized, assessments are levied in it just the same as in the main district and sub-districts have the power to annex lands which connect with the ditches of the sub-district or which are benefited by the work of the sub-districts. The peculiar feature of this is that only districts which maintain a levee as part of the work of the district can organize a sub-district. As the Supreme Court has held that the entire main district cannot be assessed to do what is properly sub-district work,² in districts which do not maintain a levee as part of the work of the main district, it is doubtful whether local, minute, and particular drainage work can be done at the district's expense at all. Under the Farm Drainage Act (Section 43) sub-districts may be formed either by the owners of land in the main district (no majority requirements being stated) or by the commissioners without any notice, in any case where it is necessary to provide for the drainage of separate areas within the main district by lateral drains or proposed drains which are independent of each other except as to the main drain or outlet. Assessments in these sub-districts are made just the same as in the main districts under the Farm Drainage Act. Additional provision is made in the Farm Drainage Act for a sub-district within a sub-district, which is called a minor sub-district. This drains a particular independent area within the sub-district.

¹Sny Island D. D. v. Boyd D. D., 273 Ill. 533; Koeller v. Salisbury, 276 Ill. 230.

²Sangamon and Drummer D. D. v. I. C. R. R., 272 Ill. 374.

Under the Farm Drainage Act, where sub-districts contain not less than five sections of land, upon a petition signed by a majority of the land owners in the sub-district, such sub-district can have independent commissioners of its own, who are elected at the same time as the drainage commissioners in the main district; these latter are always ex-officio commissioners of the sub-district.

In both acts, the accounts and records of assessments of sub-districts are always kept separate from the records and accounts of main districts and as administrative units they are entirely independent of each other.

Lastly, the provisions of these two acts in regard to the liability for replacing public highway bridges which are destroyed or removed by the drainage commissioners in doing drainage work should be noticed, because of the larger amount of litigation growing out of this question. Section 55 of the Levee Act provided in part that the expense of replacing highway bridges destroyed or removed by the drainage district where the work of the drainage district was constructed along the line of any natural depression, channel, or water course, should be borne by the road districts, and Section 40½ of the Farm Drainage Act contained a similar provision. The Supreme Court held these provisions unconstitutional¹ in so far as they attempted to impose any liability upon the road districts or highway commissioners regardless of whether the bridge crossed a natural depression or channel or whether it was a bridge across an artificial drainage district dug by the district. However, the provision in both acts requiring a railroad company to remove its trestle or bridge in the line of a natural stream or channel which the drainage district wishes to utilize in constructing its work has been held valid.²

MISCELLANEOUS INDEPENDENT ACTS

It is believed that the above discussion covers all of the important outstanding features of the two drainage acts. In addition to the Farm Drainage Act, and the Levee Act proper, there are the following independent acts, the titles to which sufficiently suggest their subject matter and which are largely applicable to districts organized under both of the above acts:

1. An Act to extend the time and provide for the payment of assessments of benefits in drainage districts, approved and in force May 22, 1885. This provides in brief that after an assessment is levied or confirmed, on petition of the land owners, it can be divided into installments, or the maturities of assessed installments can be lengthened.

2. An Act to maintain and improve county ditches heretofore constructed to drain certain swamp and overflowed lands, approved June 3, 1883, in force July 1, 1883. In brief this Act provides that the board of county commissioners can form drainage districts within a county and classify the

¹Peo. v. Block, 276 Ill. 286.

²Peo. v. C. B. & Q. R. R. Co., 212 Ill. 103.

lands as under the Farm Drainage Act for the purpose of securing ample and permanent main channels of drainage for peoples in the counties. It is believed that this Act has not been much used.

3. The Act of June 4, 1889, for the dissolution of drainage districts has already been fully discussed.

4. An Act authorizing all drainage districts to issue bonds and providing for the registration and payment of the same. This Act is for the registration of bonds with the Auditor of Public Accounts and he is authorized to issue a certificate to the commissioners of the drainage district issued in the same and certify this to the county clerk of the county in which the district is organized, and the clerk is then authorized to make out a tax list of the lands and property in the district and ascertain also its pro rata share of the amount so certified by the auditor and deliver the same to the treasurer of the district. This Act very evidently was intended to apply to farm drainage districts only, for the clerk in a levee district would have no authority to levy an assessment for any such purpose.

5. An Act in relation to the abatement of assessments for benefits in levee and drainage districts. This provides for a petition by the land owners or commissioners whenever the assessments for benefits in a district exceed the total amount of all indebtedness to the district and on a finding to that effect, permitting the court to enter an order rebating the assessment.

6. The Act in relation to adjoining drainage districts making the upper district liable to the lower district for outlet has already been discussed.

7. An Act to provide for constructing pumping plants and maintaining the same in operation in drainage and levee districts and special drainage districts heretofore or hereafter organized, and to legalize and to validate former proceedings, assessments, bond issues, indebtedness and expenditures in regard to or on account of the erection, maintenance and operation of pumping plants, etc., approved June 27, 1913. This Act was passed to validate the unconstitutional pumping plant acts of 1905, 1907, 1911.¹ It also empowers all districts organized under the Levee Act and special districts under the Farm Drainage Act to build pumping plants and assess the land therefor.

8. An Act to enable adjoining drainage districts to construct a joint pumping station or joint pumping stations, ditches, levees, or other works, to contract for the proportion of the cost of construction and maintenance of the same, to be paid by each and providing for the approval of the same (by a hearing to all persons interested after notice) approved June 27, 1913.

9. An Act to give Circuit Courts and County Courts concurrent jurisdiction in all matters pertaining to the organization of farm drainage districts (both acts) approved June 5, 1909. This Act provides *that appeals may be*

¹See *Brooks v. Hatch*, 261 Ill. 179.

taken from the final orders of either the County or Circuit Courts in drainage matters to the Supreme Court and was held constitutional.¹

10. An Act to invest the corporate authorities of cities and villages with power to construct, maintain, and keep in repair drains, ditches, levees, dikes, and pumping works, for drainage purposes by special assessments upon the properties benefited thereby. This Act has no reference to farm drainage with which we are primarily concerned in this report, and should be ignored.

11. An Act to enable owners of farm lands which form any part of a drainage district in which there is located in whole or in part a city, town or village, to reorganize as a separate drainage district with certain rights and duties with relation thereto. (June 26, 1917.) The rights and duties referred to are simply an adjudication as to the share of indebtedness of the original district which the city or village so reorganized should assume.

12. An Act to authorize the levying of special assessments on the lands, railroads, public highways, and municipal corporations situated within any drainage district, so as to provide the funds necessary to pay the cost of construction for benefits that shall have been conferred by the construction of any improvement without special assessments having been legally levied prior thereto, and providing for the issuance of bonds payable out of such special assessments authorized by this Act to be levied. (June 11, 1917.) This Act by its express terms only applies to assessments in districts "within which there shall have been *heretofore* at the request of such commissioners" constructed any drainage improvement, etc.

These Acts are mentioned in brief in connection with the Levee Act and Farm Drainage Act in order that the pertinence of the discussion in the next chapter may be apparent.

DEFECTS IN THE PRESENT LAW

The mere statement of the methods of procedure in the preceding discussion will suggest at once a great defect in the present statutory provisions relating to drainage in Illinois, namely: the intricacy and confusion caused by the two independent Drainage Acts and by the twelve Independent Acts applying sometimes to both the Farm Drainage Act and the Levee Act, sometimes to one of those acts, and sometimes to the Levee Act and to certain kinds of districts only under the Farm Drainage Act. The first great defect, then, is a lack of simplicity in our drainage statutes. If the Farm Drainage Act and if the Levee Act and these other independent acts were pieces of model legislation considered separately, the mere fact that they are on the statute books and are being construed by the Supreme Court sometimes without making clear just which act the decision relates to, would be a grave defect unless it were impossible to have one act covering all drainage situations in the State.

¹250 Ill. 404.

But there are defects in the acts considered separately which need to be pointed out and it might be well to state in advance the source of some of these defects. Too many times a particular district in some part of the State has had some particular problem to grapple with and has rushed to Springfield to get the Legislature to amend some section of these two acts to provide for the transitory emergency in that particular drainage district without reference to the effect of amendment upon drainage districts all over the State. Again owing to a confusion created by the presence of the two acts, the Levee Act at least has been amended by adding procedure which could only be applicable to the Farm Drainage Act and which is entirely out of harmony with all the rest of the Levee Act. When we come to discussing suggestions for remedies, these matters will be more fully developed and we turn now to the particular defects in the present legislation, particularly with reference to the Levee Act which is by far the most important statute used in the organization of the large drainage districts in late years.

Section 44 on abandonment provides that at any time before the contract is let, on a petition of a majority of the landowners owning a majority in area of the land, the court may abolish the district upon the payment by the petitioners of the court costs to that date. As before indicated the Supreme Court held that as to districts organized before July 1, 1919, this act could not be held applicable because it would be unconstitutional in impairing the obligations of contracts made by the district with engineers, attorneys, and others between the time of the organization of the district and filing of the petition to abandon. But it is possible that no contract would be impaired in a district organized after July 1, 1919, because attorneys, engineers, commissioners and all other persons performing valuable services for the district after its organization and before the letting of the contract would do so with knowledge and with the risk that these services would not be compensated if a proper petition to abandon were filed and acted upon. Certainly justice would seem to require that after a district is organized all lawful expenses up to the time of abandonment should be paid by those who wish to discontinue the work. Moreover, as a practical proposition, there is always a low water mark of interest in drainage projects which occurs just after the first assessment has been levied and before the work has been done. It is at this time that the landowner can see his money going out and yet cannot see the benefits which he will derive because the work itself has not been completed. The feasibility of the work ought to have been pretty well threshed out in the organization proceedings; and the majority necessary to put through a petition to abandon and abolish the district ought to be larger than at present provided.

There are a number of unconstitutional provisions, expressly so declared in the present Levee Act, which should be eliminated entirely. The second proviso to Section 55 states: "that the amount so assessed against any rail-

road company or private corporation shall, upon the confirmation of the assessment roll, by the County Court, become a lien upon the real property of such railroad company or private corporation and have the same force and effect as a judgment at law in favor of such district against such railroad company or private corporation and execution may issue thereon as upon judgments in courts of record in other cases and shall have a like lien upon personal estate." This is unconstitutional because a drainage proceeding is strictly *in rem* and can only be enforced against the property within the district.¹ Again, the third provision of Section 65 is that the "corporate authorities of such road or railroad are hereby required at their own expense to construct such bridge, culvert or other work or to replace any bridge or culvert temporarily removed by the commissioners in doing the work of such district." As applied to the public highways, this is unconstitutional because it imposes indirectly a tax upon the inhabitants of the road district by drainage commissioners in whose selection they have had no voice (that is, they are not corporate authorities of such road districts). The Supreme Court, however, has recently held that while a drainage district has to stand the expense of replacing such a bridge, they only have to replace the same kind of a bridge that they took out and when replaced, a bridge across a natural depression or stream must be maintained by the road authorities.

Sections 48 and 49 give a justice of the peace jurisdiction to organize a district or to hold assessment proceedings up to the point of confirmation in all cases where the amount involved does not exceed two thousand dollars. The organization of a drainage district and the difficult legal principles involved in making assessments make this jurisdiction of the justice more of a pitfall than a convenience, and ninety per cent of the lawyers in this State, we believe, are in favor of leaving justice courts out of these matters.

The last part of Section 48 provides that after the assessment is made in the justice court following as far as possible the procedure in the County Court, the justice shall not confirm the assessment but shall present and file the assessment roll for confirmation in the office of the clerk of the County Court of the county in which the greater part of the land in such district is situated and like proceedings shall be had with the same by the County Court as in case of assessments made by juries in districts organized by said court. This was part of the old Levee Act of 1885 and at that time assessments of damages and benefits were made in both the County Court and justice court, either by the commissioners or by a jury empanelled without any notice whatever to the landowners who went out on the lands and prepared their assessment and brought it back to court complete and then for the first time the landowners were allowed to come in and make objection to the assessment. After objections were made, if the jury or the commissioners saw fit to correct them, they could do so under the directions of the court

¹Spring Cr  ek D. D. v. E. J. & E. R. R. Co., 249 Ill. 260.

and after all the evidence was heard and the corrections had been made or not made as the case might be, the court confirmed the assessment. This kind of a jury and an assessment of damages made by commissioners under the above circumstances were held unconstitutional in the Supreme Court as being in violation of the eminent domain proceedings of the Constitution.¹ And after this the present method of having an eminent domain jury as provided in Sections 17 and 17a, was introduced into the Levee Act to meet the constitutional objections.

Section 48a was framed with the old unconstitutional system in mind and is utterly anomalous in the light of the present system.

Section 58a of the Levee Act added in 1917, relating to the annexation of lands outside the district on petition of their owners or on petition of the requisite majority of owners owning the requisite majority of land in a certain area outside the district, provides that after the annexation these lands shall be "classified and taxed like other lands," etc. There is no provision in the Levee Act for classification and all these provisions about classifying should come out of that section.

Section 59 of the Levee Act contains the "joker" above referred to in that it only allows the formation of sub-districts in districts which maintain a levee as part of the work of the main district. Certainly all drainage districts should be allowed to form sub-districts without regard to whether they have a levee or not.

Section 58 as amended in 1919 now provides that land outside the drainage district which is benefited by the work in the district cannot be annexed by the drainage commissioners unless the owner of such outside land has also connected his land artificially with the ditches of the drainage district or with any artificial drains that lead into the ditches of the district. Formerly this section provided that land which was *either* benefited *or* had been connected artificially with the ditches of the district might be annexed and that seems to be the preferable course. However, under the old act this right of annexation was subject to abuse in this way: a small district in which the requisite majority of landowners could be obtained might be formed and then reach out and take in a great number of unwilling areas of land which were benefited by the work of the district. The Supreme Court held in *People v. Swearingen*, 273 Ill. 630, that if it was clear that a district was organized for this illegal purpose, the organization would be void but they intimated in that opinion that if a district was *bona fide* organized it could annex unwilling owners of land benefited (who had not artificially connected with the ditches of the district), even though the effect of such annexation was to destroy the requisite majority of land. As a compromise between these two undesirable results, Section 58 might be made to provide that annexation

¹Wabash R. R. v. Coon Run D. D., 194 Ill. 310; Juvenall v. Jamesburg D. D., 204 Ill. 106.

could take place up to the point where the requisite majorities were not destroyed, and that at the time of such annexation the original unwilling owners or those who did not sign the petition at the time of the organization of the original district could be permitted to add their names to the original petition and thus increase the original majority. This would be in line with the provisions of Section 12 which permits the commissioners before the original district is organized to enlarge the boundaries by taking in other tracts benefited up to the point where the requisite majorities are not destroyed.

Section 63 provides a special oath which the commissioners formerly took when making assessments under the old unconstitutional assessment proceedings. Since these proceedings have been superseded by Sections 17 and 17a, this oath has become utterly unnecessary and the Supreme Court has held that Section 63 has been repealed by implication.¹ Section 63 should be expressly repealed and taken out of the act.

There are a few other matters which are urged as defects in the Levee Act, but which are not so regarded by us.

It has been urged that there are too many appeals to the Supreme Court allowed from the time the district is organized through the first assessment. An appeal is allowed from the order organizing the district; from the order approving or dismissing the petition to do additional work under Section 37; or from the final order confirming the assessment roll. But these provisions for appeal have this distinct advantage: when an appeal is not taken, the matters settled in the adjudication up to that point are final and cannot be complained of in a subsequent appeal from the subsequent orders. If one appeal were allowed at the time of the first assessment and the organization of the district, the necessity for the additional work and the fairness of the assessment could all be litigated, two of the three proceedings might be entirely correct and yet the whole thing have to be done over again because one step was erroneous. To use a homely phrase, we feel that it is best to settle one thing at a time and settle it finally.

It has also been urged that the provision under the Levee Act for doing additional work and levying additional assessments is unduly expensive and cumbersome. Under Section 37 it required the making of a new assessment from start to finish. But it is hard to see how any constitutional provision could be made allowing the commissioners to levy an additional assessment without a hearing before the jury or at least without a public hearing on the assessment roll before themselves. The jury in the first assessment simply determines that the amount of *that* assessment against each tract of land, is not in excess of the total benefits to that tract, and represents the proportionate part of the benefits to that tract as compared to the total benefits to the district. If the commissioners were to levy an additional assessment upon the same proportion, it is hard to see how the question of benefits to

¹Hillview D. D. v. Doudall, 276 Ill. 33.

that land would not be open on tax objections just as it is today under the Farm Drainage Act. The one great virtue of the Levee Act is that when an assessment is levied and confirmed and not appealed from, it is tolerably certain that the money would be collected and this certainty of collection justified a good deal of preliminary trouble to make it so.

One very positive defect in the present Levee Act is the provision requiring a petition of the requisite majority to organize a very large drainage district lying in several different counties. It is almost impossible to get enough signers to such a petition and when signers are obtained, it is nearly impossible to find a man who can truthfully make the affidavit of his own knowledge that the petition is signed by the requisite majority. In other words, it is hard to get a petition and just about as hard to make proof of the fact if it is gotten. However, at the time of assessment, the name of each owner of land in the district and the description of the land must be known in order to get jurisdiction over him. If he lives outside of the counties where the district is located, he is a non-resident within the meaning of Section 3, and a notice must be sent to him and since this information must be obtained, then, it is possibly not unduly burdensome to require it to be obtained in advance. Some ignorant people object to the limitation upon assessments that they must not exceed the total amount of benefits to the lands, but until the Constitution is changed, this limitation cannot be infringed.

Turning now to the Farm Drainage Act, the first and most obvious defect is the confusion created by the presence of the three kinds of districts which it covers, namely, one-town districts, union and special districts. Even if there is some logical reason for providing different methods of organizing covered by these three kinds of districts and based on the township system, it is hard to see why after their organization the procedure in the different districts should vary so widely and why for instance this provision should be made for dissolving a one-town district different from dissolving union or special districts.

Another very serious defect in the single town and union districts is the fact that these districts are organized before highway commissioners and not before a court, and that after their organization the important acts of assessment and classification are entrusted to mere drainage commissioners and not to a court. There is this important advantage in organizing a drainage district before a court: The record of a court cannot be gone into in any collateral proceeding and contradicted by matter *dehors* the record, but the jurisdictional findings of the highway commissioners in organizing a district or spreading an assessment can be contradicted.¹ Moreover, the very important rights of land owners are far better secured before a judicial tribunal than before a local body of highway commissioners, untrained in applying the law. It is true that the litigation over the formation of districts under the

¹People v. Graham, 280 Ill. 303.

Levee Act has been more frequent in the Supreme Court in late years than similar litigation affecting the organization of farm drainage districts. But this is due first to the fact that very few large drainage districts are organized any more under the Farm Drainage Act, and further because there is no method of judicial review of the organization of a single town or union drainage district except in a proceeding by *quo warranto*. Now this is really a point in favor of the Levee Act method of organization because if the order organizing a Levee Act district is not reviewed by appeal or writ of error to the Supreme Court, the Levee Act districts can be attacked on fewer grounds in *quo warranto* than the farm drainage districts organized by highway commissioners.

We said above that assessment and classification is made by drainage commissioners under the Farm Drainage Act and not by a court. This is not strictly true because an appeal is allowed to the County Court from the classification hearing after notice to all parties interested and because of this fact, the mere errors in the making of a classification cannot be attacked collaterally. But the County Court acts only as an appellate tribunal and does not attempt to make the jurisdictional findings with regard to notice to the land owners; and the commissioners' finding as to notice to the classification meeting can be attacked collaterally.¹

As before pointed out, when the commissioners of a farm drainage district make an assessment, the law provides no notice whatever to land owners and although an appeal is allowed from this assessment, it is very doubtful whether it would affect the right to collaterally attack the assessment if a land owner could show that as a matter of fact he had neither notice nor knowledge of the time of making the assessment.

The provisions for the organization of sub-districts under the Farm Drainage Act (Section 43), even with the 1919 amendment, are unduly involved and confusing. The principle of having independent commissioners for sub-districts instead of having the commissioners of the main district act as *ex officio* commissioners thereof, tends to a lack of co-ordination between the main district and the sub-district. The provision for minor sub-districts within the sub-districts seems hardly necessary.

Some other provisions of the Farm Drainage Act have been criticized but it is an open question whether these provisions are defective or not. The principle of elective commissioners found in all Farm Drainage Act districts (with exceptions in small special and mutual districts) is thought to be less advantageous than commissioners appointed by the County Court. Elective commissioners have this advantage, that they always (under the Farm Drainage Act) are selected from land owners in the district residing within the county in which it was formed and are the choice of the people who have to pay for the work, and who therefore, theoretically, would have the

¹People v. Graham, 280 Ill. 303.

best interest of the district at heart because they themselves are affected by whatever is done. But on the other hand, a majority of the owners in the district who organize it have the power to elect their own commissioners who may represent the majority very well and adopt the kind of plan which will peculiarly benefit the majority, but which will leave the minority out of their calculations. There is no court to which the minority can go to show defects in these plans but kind of work to be done depends upon the caprice of the commissioners except that they can be mandamusd to afford main outlets of ample capacity including all those in the minority. Commissioners appointed by the County Court, at least theoretically, would be more likely to be disinterested persons and yet when the County Court appoints commissioners, provision is usually made that it shall be done upon a petition of a majority of the land owners so that the majority would still have some controlling power. As above pointed out, the appointive commissioners under the Levee Act need not be land owners in the district and there is a greater latitude in securing competent parties.

Special districts under the Farm Drainage Act can only be organized when a bond for the engineer's and attorney's fees is put up by the commissioners. This provision is found in some acts of other states as will be pointed out in the next chapter, and its wisdom is an open question. On the one hand the attorneys, engineers and commissioners who devote their time to reporting to the court whether a district should be formed, ought to be paid for their services, but whether it is wise to make the formation of the drainage district conditioned upon the payment of those expenses or whether it is better to leave the attorneys and engineers to make their own private contract with the petitioners and leave them free to insist upon the payment of these expenses or to take the risk of the formation of the district in some cases, is a matter involving considerable difference of opinion. It seems only fair to suppose that fewer financial restrictions or burdens placed upon the petitioners in the organization of a district will be more conducive to the organization of a larger number of drainage districts. Because of the lesser relative importance of the Farm Drainage Act and because of the immense amount of tinkering that has been done with it in the last few years, specific criticisms and suggested changes of phraseology, will not be gone into as was done in the case of the Levee Act. The objection to the Farm Drainage Act lies not so much in the details of its provisions as in the fundamental principles underlying its provisions for organization and assessment.

SUGGESTIONS FOR IMPROVEMENT BY LEGISLATION

It is perhaps an open question whether or not both the Levee Act and the Farm Drainage Act should be repealed and a single, simplified code substituted in their stead providing a single, uniform procedure for the organ-

ization of all drainage districts and for all work of construction and maintenance. Or, the suggestion has been made that at least the Farm Drainage Act should be amended by abolishing the distinctions between one-town, two-town and special districts, and providing that all districts under the Farm Drainage Act shall be organized in the County Court just like the present special districts and that the future procedure, whether in the County Court or before elected drainage commissioners, shall be uniform in all farm drainage districts.

However, it is respectfully submitted that in the light of the foregoing discussion of defects, there can be little dissent that the following specific amendments to the Levee Act are badly needed to make it function properly :

1. Section 44 on Abandonment should be amended to require that the petitioners for abandonment should be required to pay all the legal obligations incurred by the district as well as court costs, as a prerequisite to abandoning the work after a district has been legally organized.

There is perhaps some question as to who should pay the expenses and court costs on petition for abandonment. If the district has been fraudulently organized by the original petitioners, there is justice in the contention that when the district is abandoned the original petitioners should pay all expenses. On the other hand, all owners of the district have had ample opportunity to present their case to the court at the time the district was organized, and if clear proof of fraud were shown it ought not to be presumed that any court would go ahead and organize the district. It is, therefore, recommended that after the district is formally organized those who seek its dissolution should pay all of the expenses thereof.

2. The unconstitutional provisions of Section 55 should be eliminated and a concise statement of the law concerning the duties and rights of drainage districts in relation to highway bridges, in the light of the decisions of the Supreme Court, should be inserted in lieu thereof.

3. Sections 48 and 49 concerning justice-of-the-peace jurisdiction should be repealed.

4. The word "classified" should be eliminated from Section 58a and provision made that annexed land should be assessed for its proportionate share of the cost of the original improvement on the basis of comparative benefits from the original work.

5. Section 55 should be amended to provide that sub-districts may be formed in any drainage district, whether such district has a levee or not, and without any vote of the people in a municipality contained in such sub-district, as was provided formerly.

6. Section 58 should provide that lands may be annexed to a drainage district if they are either benefited or connected with the ditches of the district.

7. Section 63, which the Supreme Court has held has been repealed by implication, should be expressly repealed.

It is generally felt that provision should be made that in case a drainage district is not organized, the engineer, commissioners, and attorneys who have necessarily devoted their time toward preparing the reports to the court should not lose all compensation for their services. It has therefore been suggested that Section 9 be amended to give the commissioners power to borrow money to pay for the expense of making surveys etc., and that Section 14 be amended to provide that if the court find the district should not be organized, the proceeding should be dismissed at the cost of the petitioners, said costs to include all legitimate expenses and obligations incurred by the commissioners.

It has also been suggested that somewhere the act should define the "owner" for the purpose of signing petitions, with special reference to situations where there are a number of tenants in common as owners of a particular tract, or where there is a life estate with remainder or remainders in fee simple in any tract.

It has also been suggested that Section 43 providing for a rehearing of the question of assessments against overflowed lands in levee districts should be omitted because all of the questions covered by that proceeding are litigated at the time of making the assessment.

It has been suggested that Section 38 should be amended to provide that when bonds are issued they may be sold by order of the court for less than par. This is suggested because a six per cent drainage bond is unsalable under present abnormal conditions.

Some minor changes making definite publication dates and making more specific the provision relating to assessment rolls, might be profitably incorporated.

As a matter of arrangement, the present sections might profitably be shifted around so that the logical steps of organization, planning and financing of the work, construction, maintenance, selection and duties of commissioners, and miscellaneous powers of the district and abandonment—should be taken up in that order in the statute, preserving the present wording except for the suggested foregoing amendments.

Immediately following this section appears a suggested draft of a revision of the Levee Act which was introduced in both houses of the Legislature in 1921 and which incorporates most of the above suggestions.

Inasmuch as but few of the larger districts are being organized under the Farm Drainage Act and as many of the large districts formerly organized under it, are changing over and adopting the Levee Act for future work, it is not perhaps so important that the Farm Drainage Act be overhauled.

If this is done it is suggested that the following fundamental changes should be made:

(a) All farm drainage districts should be organized on petition to the County Court like the present special districts with the possible elimination

of the requirement that the petitioners must give bond to cover all organization expenses, including attorneys' and engineers' fees. They should of course pay the court costs if the petition is dismissed.

(b) If the present system of classification and assessment made by the commissioners is retained, provisions should be made that notice should be given to all land owners of the date of the making of the assessment list by the commissioners, so that if no appeal was taken by any land owner he would be precluded from raising any question of benefits on tax objections.

(c) The procedure of assessment and classification and for the issuing of bonds should be made uniform in all drainage districts.

(d) In the light of the case of *People v. Wilder*, 257 Ill. 304, Section 43 in relation to sub-districts should be amended to provide that any area within the main district needing more minute and particular drainage can be organized into a sub-district (without regard to whether it is drained by a lateral drain) and commissioners of the main district should be made *ex officio* commissioners of the sub-district, and the commissioners should be given the power to annex lands to sub-districts which connect with the sub-district ditches or are benefited by the work or to change the boundaries of sub-districts on proper notice whenever in their judgment the drainage conditions in the district warrant such action.

CHAPTER XXXV—STATUS OF THE REVISED LEVEE ACT

As has been stated, the 1919 Legislature authorized the State Geological Survey to make an investigation of the legal and engineering problems in connection with drainage and the reclamation of wet lands in Illinois, and made an appropriation for that purpose.

The Revised Levee Act, which is herewith printed as a matter of record, was prepared on the basis of the suggestions made in Chapter XXXIV. It embodies the results of two years' investigation of the drainage statutes and decisions of our Court, and represents the suggestions sent in by drainage lawyers from all over the State in response to questionnaires asking that defects in the present law be pointed out. It was framed after personal conference with a score of leading drainage attorneys from all sections of the State.

The Revised Levee Act was introduced in the Senate of the 52nd General Assembly by the Committee on Drainage as Senate Bill No. 473. It passed the Senate on June 13, 1921, but failed of passing the House because of lack of time. Probably it will be presented again at the next Assembly.

For the convenience of those wishing to make detailed study of the Bill, an outline precedes the reprint, and a cross reference table facilitating comparison of the old Levee Act and the proposed revision immediately follows it.

OUTLINE OF REVISED LEVEE ACT

ARTICLE I—ORGANIZATION

SECTION	PAGE
1. Title	277
2. Petition organizing drainage districts.....	277
3. Notice of filing petition.....	277
4. Jurisdiction of courts.....	278
5. Hearing—Commissioners—Preliminary expenses	279
6. Organization of commissioners.....	280
7. Commissioners to examine land—Report.....	280
8. Dismissal of proceedings	281
9. Surveys—Profiles, etc.	281
10. Alteration of plans—Boundaries—Proviso.....	281
11. Continuances—Filing report—Notice—Contesting confirmation.....	282
12. Confirmation—Review—Modifications	282
13. Referring back report—Adjournment.....	282
14. Order of confirmation organizing District.....	283
15. Nature of Drainage District.....	283
16. Appeals and writs of error.....	284

ARTICLE II—THE FIRST ASSESSMENT

17. Agreements as to damages—Assessment roll.....	284
18. Assessments and obligations of corporate authorities.....	285

SECTION	PAGE
18½. Filing of roll—Notice by commissioners—Hearing before jury.....	286
19. Organization of jury—Examination of lands—Verdict confirmation.....	286
20. Payment of benefits in installments.....	288
21. Installments—Interest	288
22. Certified copy of assessments delivered to commissioners.....	289
23. Treasurer—Bond	289
24. Duties—Term of office	289
25. Commissioners—Notice of assessment	289
26. Delinquent assessments	290
27. Payment before sale	291
28. Neglect to pay assessment or installment.....	291
29. Act to be liberally construed	292

ARTICLE III—POWER TO BORROW MONEY

30. Commissioners' power to borrow money.....	292
31. Bonds—How attested	293

ARTICLE IV—CHANGES IN PLANS AND ASSESSMENTS; PAYMENT OF DAMAGES AND CONTRACTS FOR WORK

32. Change in construction	293
32½. Abandonment of drain	294
33. Payment of damages	296
34. Letting of contracts—Advertising for bids	296
35. Credit in assessment for work.....	297

ARTICLE V—USE OF MONEY AND ADDITIONAL ASSESSMENTS

36. Money to be used under direction of court.....	297
37. Additional assessments	297
38. Inclusion of void or unpaid assessments	298
39. Proceedings when assessment is invalid.....	299
40. Progress and hearing thereon.....	299

ARTICLE VI—MAINTENANCE OF WORK AFTER COMPLETION

41. Assessment for repairs	300
42. Annual amount of benefits	300

ARTICLE VII—ANNEXING LANDS TO ORGANIZE DISTRICTS

43. Assessing lands benefited outside of the District.....	302
44. Use of drains by owners within District, Voluntary annexation by out- side owner	302

ARTICLE VIII—SUB-DISTRICTS

45. Constructing additional ditches—Proceedings	303
---	-----

ARTICLE IX—DRAINAGE COMMISSIONERS; ORGANIZATION; POWERS; DUTIES AND SUCCESSION

SECTION	PAGE
46. Official oath	305
47. Chairman—Secretary	305
48. Quorum	305
49. Drainage record	305
50. Reports of commissioners	306
51. Bond of commissioners	306
52. Pay of commissioners.....	306
53. Power of commissioners to contract	307
54. Power to enter lands	307
55. Powers to eminent domain	307
56. Power to compel opening of watercourse.....	308
57. Power to clean out watercourse—Meaning of ditch.....	308
58. Power to maintain dredge boats	308
59. Refusal of commissioners to perform duty	309
60. Removal of commissioners	309
61. Succession of commissioners	309
62. Change to single commissioner.....	309

ARTICLE X—PENALTIES

63. Penalties for injuring drain	310
64. Civil liability for drainage.....	310

ARTICLE XI—MISCELLANEOUS

65. No second tax—Upper district benefited by lower.....	310
66. Outlet drainage districts.....	310
67. Mutual drainage districts.....	312
68. Lawful to include in district all lands protected.....	313
69. Reorganization of other districts under this Act.....	313

REPEAL AND SAVING

69½. Repeal of levee and dredge boat acts.....	314
70. Construction	314
71. Unconstitutional parts of Act not to nullify remainder.....	314
72. Jurisdiction of courts	315

REPRINT OF THE REVISED LEEVE ACT

Senate Bill No. 473 constitutes the Revised Levee Act. It is herewith reprinted from the official copy with minor changes.

SENATE BILL No. 473

For an Act to provide for the construction, reparation and protection of drains, ditches and levees, across the lands of others, for agricultural, sanitary and mining purposes, and to provide for the organization of drainage districts, and to revise the law in reference thereto.

SECTION 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly:* That this Act shall be known as "The Revised Levee Act."

ARTICLE I.

ORGANIZATION.

Sec. 2. PETITION ORGANIZING DRAINAGE DISTRICTS.] Whenever a majority of the owners of land within a district proposed to be organized who shall have arrived at a lawful age, and who represent at least one-third in area of said land, or whenever one-third or more of the owners of lands within a district proposed to be organized who shall have arrived at lawful age and who represent a major portion in area of said lands, said majorities being hereinafter termed the requisite majority, desire to construct drains, ditches, levees or other work to be known in this Act as a "drainage and levee district," or "drainage and levee work," across the lands of others for agricultural, sanitary or mining purposes, or to maintain and keep in repair any such drains, ditches or levees heretofore constructed under any law of this State, or to establish in said district a combined system of drainage or protection from overflow, independent of levees, for said purposes, and maintain the same by special assessment upon the property benefited thereby, such owners may file in the county court of the county in which the largest acreage of the lands so proposed to be organized into drainage district lies, a petition signed by the requisite number of land-owners owning the required area of said proposed drainage district as in this section provided, setting forth:

1. The proposed name of the said drainage district;
2. The necessity of the same;
3. A general description of the lands proposed to be affected;
4. A general description of the proposed work.
5. The names of the owners, when known; and
6. A prayer for the organization of a drainage district, by the name and boundaries proposed and for the appointment of commissioners under this Act.

Sec. 3. NOTICE OF FILING PETITION.] Such petition being filed, the clerk of said county court, or circuit court, shall cause three weeks' notice of the presentation and filing of such petition to be given, addressed "to all persons interested,"

- (a) By posting notices thereof at the door of the court house of the county or counties in which the district is situated,
- (b) And in at least ten (10) of the most public places in such proposed district,
- (c) And also by publishing a copy thereof at least once a week for

three (3) successive weeks in some newspaper published in the county in which the largest acreage of the proposed district lies.

Such notice shall state :

1. When and in what court the said petition was and is filed,
2. The boundaries and name of the proposed drainage district (but no description of drains or ditches need be given),
3. And the day and term of the said court when petitioners will ask a hearing of said petition.

If any of the land-owners of said district are not residents of the county or counties in which the proposed district will lie, the petition shall be accompanied by or shall include an affidavit giving the names and places of residence of such non-residents, if known, and if unknown, stating that, upon diligent inquiry their places of residence cannot be ascertained; and the clerk shall send a copy of the notice aforesaid to each of said non-residents, whose residence is known, within five (5) days after the first publication of the same. The certificate of the clerk or publisher or the affidavit of any other credible person affixed to a copy of said notice shall be sufficient evidence of the mailing, publication and posting, respectively, of said notices.

Sec. 4. JURISDICTION OF COURTS.] The county court in which said petition shall be filed may hear the petition at any probate or common law term, and may determine all matters pertaining thereto, and all subsequent proceedings of the district when organized under this Act, and may adjourn the hearing from time to time, or continue the case for want of sufficient notice, or other good cause. The court, upon application of the petitioners, shall permit the petition, affidavit and orders to be amended, and no petitioner shall have the right to withdraw from said petition, except by the consent of the majority of the other petitioners thereon, or where it shall be known to the satisfaction of the court that the signature of the petitioner was obtained by fraud or misrepresentation.

The circuit courts of this State, and the superior courts of Cook County, are hereby given concurrent jurisdiction with county courts in all other matters pertaining to the organization of drainage districts, and drainage and levee districts, and the operation thereof; and the clerk of the circuit court shall, when the proceeding is pending in such court, do and perform in the premises each and all duty or duties required by the clerk of the county court in drainage and levee matters, when such proceedings are pending therein; and all reports, complaints, oaths, affirmations, confirmations and returns, in such matters required to be made to the county courts shall be made in the circuit courts of this State, and the superior courts of Cook County, when the proceeding is pending therein. Wherever the words "county court", "court," "clerk of the county court," or "clerk" are used in this Act they shall be held to refer to the circuit court, superior courts of Cook County or the clerks of said courts, where applicable.

The several judges of the circuit courts of this State and the superior courts of Cook County are hereby given jurisdiction in vacation to make all necessary orders and hear and determine any and all matters pertaining to the organization of drainage districts and drainage and levee districts, and the operation thereof, the same as in term time. Any order so made shall be signed by the judge making it and filed and entered of record by the clerk of the court in which the proceeding is had, and from the date of such filing shall have like force and effect as if made at a regular term of such court.

Appeals may be taken from the final orders, judgments and decrees of either the county, or the superior court of Cook County to the Supreme Court.

SEC. 5. HEARING—COMMISSIONERS—PRELIMINARY EXPENSES.] On the hearing of any petition filed under the provisions of this Article, all parties through, or upon whose land any of the proposed work may be constructed, or whose lands may be damaged or benefited thereby, may appear and contest the necessity or utility of the proposed work, or any part thereof, and the contestants and petitioners may offer any competent evidence in regard thereto.

It shall be the duty of the court to hear and determine two things:

1. Whether the petition contains the signatures of the requisite majority of land-owners (1/3 adult owners owning majority in area or majority of adult owners owning 1/3 of area), and

2. Whether the proposed drains, ditches, levees, or other works are necessary or will be useful for agricultural, sanitary or mining purposes.

The affidavit of any three (3) or more of the signers of the petition that they have examined the petition and are acquainted with the locality of said district, and that said petition is signed either

- (a) By a majority of such owners who are of lawful age, who represent at least one-third (1/3) in area of the lands, or

- (b) By at least one-third of the owners of land who are of lawful age and who represent a major part in area of the lands in the proposed district, may be taken by the court as prima facie evidence of the facts stated therein, or evidence under oath of such facts may be heard in open court or by the affidavit or affirmation of any person properly taken, giving the age of such party, his or her ownership of lands to be named therein, and such oath, affirmation or affidavit shall be sufficient evidence to the courts of such facts.

Provided, That all deeds made for the purpose of establishing or defeating the prayer of said petition, not made in good faith and for a valuable consideration, shall be taken and held to be in fraud of the provisions of this Act, and the holders thereof shall not be considered as owners thereof.

An estate owned by tenants in common or joint tenants and an estate in which there is a life interest and a reversion or remainder in fee shall be regarded as one estate and all the owners thereof shall together be considered

as one owner in the organization of a district, or for other purposes under the provisions of this Act. A majority of such parties shall control the manner in which a tract of land shall be counted.

If the court finds that the petition is not signed by the requisite majority, or if the court finds that no drainage or reclamation work is necessary, the petition shall be dismissed at the cost of petitioners.

If the court after hearing all competent evidence shall determine that the petition is signed by the requisite majority, the court shall so find, and such finding shall be conclusive upon the land-owners of such district that they have assented to and accepted the provisions of this Act and any amendments that may be made thereto; and if the court further determines that the proposed ditches, levees or other works, are necessary or will be useful for the reclamation of the lands proposed to be drained thereby for agricultural, sanitary, or mining purposes, the court shall so find, and appoint three (3) competent persons as commissioners, each of whom shall hold office until his successor is appointed, as hereafter provided, to lay out and plan such proposed work and for such purposes they are authorized to borrow the necessary funds.

Sec. 6. The commissioners shall take an oath, organize, give bonds and conform as far as possible to the provisions of Article IX herein.

Sec. 7. COMMISSIONERS TO EXAMINE LAND—REPORT.] Immediately after their appointment the commissioners shall examine all the land proposed to be drained or protected and the lands over or upon which the work is proposed to be constructed and determine:

First—If drainage and levee work is proposed in the petition, whether the proposed work and the proposed location thereof is in all respects proper and feasible; and if not, what is so.

Second—What lands will be injured by the proposed work, and the probable aggregate amount of all damages such lands will sustain by reason of the laying out and construction of such work.

Third—What lands will be benefited by the construction of the proposed work, and whether the aggregate amount of benefits will equal or exceed the cost of constructing such work, including all incidental expenses, costs of proceedings and damages.

Fourth—Whether the proposed district, as set out in the petition filed, will embrace all the lands that may be damaged or benefited by the proposed work; and if not, to report what additional lands will be so affected; or whether it will include lands that will not be benefited, and are not necessary to be included in the district for any purpose, describing such lands, if any.

Fifth—The probable cost of the work recommended, including all incidental expenses, and the cost of the proceedings therefor.

Sixth—The probable annual cost of keeping the same in repair after the work is completed.

Sec. 8. DISMISSAL OF PROCEEDINGS]. If the commissioners shall find that such costs, expenses and damages are more than equal to the benefits which may inure to the lands in general of said district, by reason of the proposed work, they shall so report, and the proceedings shall be dismissed at the cost of the petitioners, including all expenses lawfully incurred by the commissioners.

Sec. 9. SURVEYS, PROFILES, ETC.] If the commissioners shall find that the proposed work, or such portion of the same as will be satisfactory to the petitioners and work of a like nature on lands they propose to annex to said district, can be done at a cost and expense not exceeding such benefits, they shall proceed to have the proper surveys, profiles, plats, plans and specifications thereof made, and they shall report the starting point, route and termini of the levees, ditches, or drains, or other work, and the dimensions of the same, and what ditches or parts thereof, should be open or tiled, and the size of tile, if any is required, and shall report their conclusions and a copy of such surveys, profiles, plats, plans and specifications to the court which appointed them.

Sec. 10. ALTERATION OF PLANS—BOUNDARIES—PROVISO.] The commissioners shall not be confined to the point of commencement, route or termini of the drains or ditches or to the number, extent or the size, or the manner of constructing of the same, or the location, plan or extent of any levee, ditch or other work to that proposed by the petitioners, but shall locate, design, lay out, and plan the same in such manner as they shall think will drain or protect the petitioners' lands with the least damage and greatest benefit to all lands to be affected thereby; and any plans, ditches, drains or other work proposed by the commissioners may, on the application of any person interested, or the commissioners, be altered or additional drains or other work shall be established by order of the court in such manner as shall appear to the court to be just. If the commissioners find that the proposed district, as described in the petition filed, will not embrace all the lands that will be benefited by the proposed work, or that it will include lands that will not be benefited, and not necessary to be included in said district for any purpose, they may extend or contract the boundaries of the proposed district, so as to include or exclude all such lands, as the case may be, and the boundaries adopted and reported by said commissioners may at any time before the court declares the district established, upon the application of the commissioners, or of any person interested, be altered by the court in such manner as shall appear to the court to be just; and the court may change the name of the district or proposed district at the same time in the same order establishing a drainage district: *Provided*, the alteration of boundaries as aforesaid shall not have the effect of so far enlarging or contracting the proposed district that the petitioners will not longer constitute a majority of the adult owners of the lands in said proposed district, who represent at least one-

third of its area, or who constitute at least one-third of the adult land-owners of the lands therein situated who represent a major portion in area of the lands therein.

Sec. 11. CONTINUANCES—FILING REPORT—NOTICE WHERE ADDITIONAL LANDS EMBRACED CONTESTING CONFIRMATION OF REPORT.] After the appointment of the commissioners as provided in Section five (5) of this act, the cause shall be continued by the court to a day for filing of their report, and in the event said commissioners are not ready to report on the day fixed, they may appear before the court and obtain a continuance or continuances until said report is ready to be filed, but such continuance or continuances shall in each instance be to a day certain and all persons interested shall take notice of any such continuance or continuances: *Provided*, that if for any reason the said report is not filed and no order of continuance is entered, the court shall not thereby lose jurisdiction, but at any time thereafter when said report is completed the commissioners may present the same to the court, and the court shall cause notice to be given in the same manner and for the same time, as provided in section 3 of this Act of a day to be fixed by the court when said report shall be heard, and the same proceedings shall be had on said date as if the proper order for continuance had been made. Upon said report being filed with the clerk of the court appointing such commissioners, the court shall fix a day not less than ten days nor more than four weeks from the filing thereof, for the hearing thereon: *Provided*, that in case the commissioners shall recommend that additional lands be embraced in the proposed district, the owner or owners of such lands shall be given notice by the commissioners, in the manner and for the time provided by section three (3) of this Act, of the hearing on said report. At the time of the hearing all persons may appear and contest the confirmation of said report or show that additional drains, ditches or other work should be constructed, or that the report ought to be modified in any particular, and may offer any competent evidence in support thereof; and the said report of said commissioners shall be *prima facie* evidence of the facts therein set forth.

Sec. 12. CONFIRMATION—REVIEW—MODIFICATION.] If upon the hearing the court shall be of the opinion that the objections are not well taken, or if no objection shall be made, it shall order the confirmation thereof. If it shall appear that additional ditches, drains and outlets not named in the report, are necessary, or that the report ought to be modified in any particular, and the court shall be sufficiently informed in the premises, it shall modify the same to conform to the equities in the premises; or if not sufficiently informed, it shall order the commissioners to review and correct their report; and may make specific directions in what respect they shall reform their report; and the court may make all necessary orders in the premises, either for the continuance of the hearing or other lawful purposes.

Sec. 13. REFERRING REPORT—ADJOURNMENT.] If the report be re-

ferred back to the commissioners for amendment, the court shall fix a day when the commissioners shall again present their report, in which case the hearing shall stand adjourned to that day, and no further notice shall be required thereof.

Sec. 14. ORDER OF CONFIRMATION.] If, after hearing all objections, if any, to the report of the commissioners, and all applications, if any, to annex other lands to the proposed district, the court finds that a drainage or levee district should be organized, the plat of the same shall be recorded and an order be made according to the findings of the court, substantially as follows:

County Court of.....County,Term, A. D. 19...
In the matter of the petition of (here insert names of the petitioners.) This day the report of.....commissioners heretofore appointed by this court to examine the lands proposed to be drained or protected and the lands over which the work is proposed to be constructed (if additional lands are recommended by the commissioners to be brought into the proposed district, insert here the giving of notice to the owners of such land, as required in section eleven of this Act) having been filed, and said report having been set down for hearing in the manner required by law, and the court having duly examined said report and having heard evidence concerning the same, and considered all objections to the same, it is ordered by the court that the report of said commissioners (or, if said report has been modified by the court, as modified by the court) be and the same is hereby confirmed; and the court further finds that the proposed work in said petition to be done will be useful for agricultural, sanitary or mining purposes to the owners of land within said proposed district; and the court also finds that the persons who have signed said petition are of lawful age and are a majority of the adult land owners, representing at least one-third in area (or one-third of the adult land owners owning a major portion as the case may be) of the land to be affected by such proposed work. And the court further finds that the said drainage district of the corporate name mentioned in said petition, viz.....bounded as follows,.....is duly established as provided by law.

.....

County Judge.

Sec. 14a. If the court finds that a drainage or levee district should not be organized, the proceedings shall be dismissed at the cost of the petitioners, said costs to include all legitimate expenses and obligations incurred by the commissioners.

Sec. 15. NATURE OF DRAINAGE DISTRICT.] And upon entering such order of record as provided in Section 14 said district is hereby declared by law to be organized as a drainage district under the name mentioned in the above order, and with the boundaries fixed by the order confirming the re-

port of the said commissioners, and said district is hereby declared to be a body politic and corporate, by the name mentioned in said order of court, with the right to sue and be sued, and to have perpetual succession, and may adopt and use a corporate seal; and the commissioners appointed as aforesaid and their successors in office shall, from the entry of such order of confirmation, constitute the corporate authorities of such drainage district, and shall exercise the functions conferred upon them by law.

Sec. 16. APPEALS OR WRIT OF ERROR.] Said order shall be final, and separate or joint appeals and writs of error may be taken to the Supreme Court by the parties affected thereby: *Provided*, the granting of an appeal or writ of error to one or more persons, or the reversal of said order upon such appeal or writ of error by such person or persons separately or jointly shall not impair nor invalidate said organization as to all other persons not appealing nor suing out such writs, nor shall such appeal or writ of error delay the work or proceedings so far as it affects the lands of such other persons. Nor shall it be a valid ground of objection on the part of any land owner upon said hearing, or upon an appeal from said order, or upon any writ of error attacking the said order, that any owner of other land has not received sufficient notice of the said proceedings, or that the said order is invalid as to the said owner of other lands; but such other owners and lands may be thereafter brought into and included in the said district, and assessed therein under the provisions of sections thirty-nine (39), forty (40), and forty-three (43) of this Act, when such other lands should properly be included in said district.

ARTICLE II.

THE FIRST ASSESSMENT

Sec. 17. AGREEMENTS AS TO DAMAGES—ASSESSMENT ROLL.] After the order provided for in Section 14 shall have been signed the commissioners shall proceed to acquire the right of way and release of damages for the construction of the proposed work, by agreement with the land owners, including the corporate authorities of any public or private corporation affected, so far as they may be able to agree with said land owners, and to make out an assessment roll in which shall be set down in proper columns:

1. The names of the owners, when known.
2. A description of the premises affected, in words or figures, or both, as shall be most convenient.
3. The number of acres in each tract.
4. And if benefits are assessed against the same, the amount of the same against each tract under a column headed "benefits," provided that no assessment of benefits shall be made against lands taken for right of way.
5. If damages are allowed for lands taken, the amount of the same

against each tract shall be set forth under a column headed "Damages," provided, that damages to lands not taken may be set off against benefits and the net amount inserted under the columns headed "Benefits" or "Damages," as the case may be.

The commissioners shall, when directed by the court, make an assessment of the "annual amount" of benefits which each tract will sustain by keeping said levees, ditches or other work in repair, and to maintain in operation pumping plants, if any there be in the district, all of which shall be known as "the commissioners' roll of assessments of benefits and damages."

Sec. 18. ASSESSMENT AND OBLIGATIONS OF CORPORATE AUTHORITIES.] The commissioners in said "commissioners' roll of assessments of benefits and damages" shall apportion to any public or corporate road or railroad, or to the streets and alleys of any municipal corporation in the district its or their respective share of the cost and expenses in proportion to benefits that will accrue to said corporation, including municipal corporations, and also set forth the damages, if any, to said corporations and give them the same notice, and at the same time, as shall be given to private individuals, and the matter of the amount of such assessments of benefits and damages shall be submitted to the same jury in the same manner as the benefits and damages to accrue to private individuals and the said jury shall proceed to assess the damages and benefits in like manner as to lands of individuals.

In case such assessment is made against any township or road district, the commissioner of highways of such town or road district shall cause the same to be levied and paid to said drainage district in the manner provided by the road and bridge law of this State.

No credit shall be given, nor damages allowed to any railroad or other private corporation or individual on account of the expense of constructing, erecting or repairing any bridge, embankment or grade, culvert or other work of the road or right of way of such corporations or persons crossing any ditch or drain, constructed in the line of any natural depression, channel or water course; but the corporate authorities of said railroad or other private corporation or individual are hereby required, at their own expense to construct such bridge, culvert or other work or to replace any bridge or culvert temporarily removed by the commissioners in doing the work of such district. Full power and authority is hereby given the drainage commissioners to remove such bridges or culverts for the purposes aforesaid, if they in their judgment find it necessary.

The cost of building, enlarging or replacing any highway bridge across the open ditches of the district, when occasioned by the work of the drainage district, whether in a natural water course or not, shall be paid by the drainage district.

When said bridges are so replaced or built, the said town, road district

or county or other public highway authorities shall thereafter, at their own expense maintain such bridge, culvert or other work. Any bridge or culvert temporarily removed by the commissioners in doing the work of said district shall be replaced at the cost of the drainage district.

Sec. 18½. FILING OF ROLL—NOTICE BY COMMISSIONERS—HEARING BEFORE JURY.] Upon the filing of the “commissioners’ roll of assessments of benefits and damages,” with the clerk of the court, the commissioners shall give ten days’ notice in the manner provided by section three (3) of this Act, of the time and place when and where they will appear before the same court in which the petition was filed for the purpose of having a jury impaneled in accordance with the provisions of section six (6) of an Act entitled, “An Act to provide for the exercise of the right of eminent domain,” approved April 10, 1872, in force July 1, 1872, and for the hearing before said jury, upon all questions of benefits and damages, to any of the land in said district.

Upon the hearing, the commissioners and all persons interested in the lands to be affected, shall have the same right of challenge of jurors as in other civil cases in the County Courts of this State. When said jury is selected they shall be sworn, to faithfully and impartially perform the duties required of them to the best of their understanding and judgment, and to make their assessments of benefits or of damages, or damages and benefits, as the case may be, according to law; and thereupon said commissioners, on behalf of said district, shall present and file as their claim against the several land owners and tracts of land, the assessment roll provided for in Section seventeen (17) of this Act, which shall make out a *prima facie* case for the commissioners, and all parties to said proceedings shall be permitted to present to said jury their case in person or by counsel, and offer any competent evidence as to the amount of benefits which any land in said district will receive by reason of said proposed work, or as to the damages to land taken or damaged thereby over which the right of way has not been obtained, and after such evidence shall be presented and argument of counsel heard, the court shall instruct them as to the law and form of their verdict.

Sec. 19. ORGANIZATION OF JURY—EXAMINATION OF LANDS—VERDICT—CONFIRMATION.] And thereupon said jury shall proceed to select a foreman and clerk from said jury, and in charge of said foreman shall, in case any party in interest shall so request, proceed to examine the lands, railroads, streets, alleys and public highways to be affected by the proposed work.

In making such assessment, the jury shall award and assess the damages and benefits in favor of and against each tract separately, in the proportion in which such tract of land will be damaged or benefited, and in no case shall any tract of land be assessed for benefits in a greater amount than its proportionate share of the estimated cost of the work and expenses of the

proceeding, nor in a greater amount than it will be benefited by the proposed work according to the best judgment of the jury.

The jury shall ascertain to the best of their ability and judgment the benefits which will accrue to the lands, railroads, streets, alleys and public highways to be affected by the said proposed work, and the damages to the lands taken or damaged thereby, over which the right of way for the construction of the said proposed work had not been obtained and, when directed by the court, the jury may also ascertain the "annual amount" of benefits which each tract will sustain by keeping said levee, ditches or other work in repair, and said jury shall make out their verdict in which shall be set down in proper columns the names of the owners when known, a description of the premises to be affected, in words and figures, or both, as shall be most convenient, the number of acres in each tract and the amount of benefits assessed, if any, and the amount of damages allowed, if any, against each tract, railroad, public highway, or municipal corporation; also, when required, the amount of "annual benefits," if any, which each tract will sustain by keeping said levees, ditches or other work in repair, and in finding such verdict they shall take into consideration their view of the premises as evidence (if such view shall have been requested by any party in interest) and consider it with the other testimony offered in the case and allowed by the court, which verdict when so completed shall produce the total sum of the estimated cost of the proposed work and the proceedings incident to the same, together with the annual amount of benefits which the lands will sustain by keeping said levees, ditches or other work in repair, when required, and the amount of damages allowed, and said verdict shall then be signed by the jury and filed in the court, and shall be taken and held to be the verdict of the jury upon all questions of benefits and damages arising in the proceedings.

The court shall, if necessary, continue said cause to a day certain for the report of the verdict of said jury, and if said jury are not ready to file their verdict on the day fixed, said cause may be continued from time to time until they have completed their verdict and have returned the same to the court and all persons interested shall take notice of the time of filing and making said report by the jury.

The court may cause to be prepared and submit to said jury a form for their said verdict, including names of the owners and descriptions of the tracts to be affected, including the railroads, public highways and municipal corporations, with blanks for the said jury to fill with the amounts of benefits and damages as they shall find, and when completed the same may be placed in form by the court in the presence of said jury, or the said jury may be recalled at any time after being discharged to correct any errors or omissions therein.

When said verdict is finally filed the court shall confirm said verdict and

enter up judgment upon said verdict, and cause the same to be spread upon the records, and such judgment and verdict shall be a lien upon such lands after the said judgment, until paid. Appeals and writs of error shall be allowed therefrom as in cases of appeals from or writs of error to county courts in proceedings for the sale of lands for taxes or special assessments: *Provided*, that the granting of an appeal in any one or more cases, to one or more persons shall not operate to defer the collection of the judgment in other cases, but the collection in other cases shall proceed as if no appeal had been taken. When said appeals are decided, if the judgment of said county court shall be affirmed, or upon said case being remanded for a new trial, if judgment shall be in favor of said district, the county court shall order the judgment so rendered to be made a part of said judgment not appealed from, and the same shall be collected as if no appeal had been taken.

Sec. 20. PAYMENT OF BENEFITS IN INSTALLMENTS.] At the time of confirming such assessments, it shall be competent for the court to order the assessment of benefits to be paid in installments of such amounts, and at such times as will be convenient for the accomplishment of the proposed work or payment of bonds that may be issued; otherwise the whole amount of such assessment shall be payable immediately upon such confirmation. The assessments or installments thereof shall draw interest at the rate of six per cent per annum from the time of confirmation until paid; but if any owner elects, he may pay the whole amount of the assessments, and interest, if any, accrued against his land, before it becomes due: *Provided*, such payment is made before any bonds are issued by the district: *And, provided, further*, that where the court has, by order, directed the whole or a part of the assessment of benefits to be paid in deferred installments, that the court may, by order, direct that the interest on such deferred installments shall be collected yearly in advance. Said assessments shall be a lien upon the lands assessed as other taxes, and such lien shall continue until said assessments are paid; and the proceedings of the county court of the county in which said lands are situated, shall be sufficient notice of such lien. When an assessment against any tract of land has been fully paid, it shall be the duty of the treasurer of such district to execute and deliver to the owner of such land, a release in full, which shall discharge such owner from all further liability to pay the same. The release may be recorded in the recorder's office of the county where such lands are situated.

Sec. 21. INSTALLMENTS—INTEREST.] In case the assessments for benefits shall be payable in installments, such installments shall draw interest at six per cent per annum, payable annually from the time of confirmation of the assessment roll until they are paid, and such interest may be collected and enforced as part of the assessment: *Provided*, that in any district where no bonds or interest-bearing obligations, at the time of such collection of

interest shall have been issued or are outstanding against such installments of assessments upon which said interest shall be collected, the commissioners of such district may, under the direction of the county court, use the money so collected as interest for the construction or maintenance of any ditches, drains or levees or other work or any necessary expenses of said district or any indebtedness of said district.

Sec. 22. CERTIFIED COPY OF ASSESSMENT DELIVERED TO COMMISSIONERS.] Immediately after the entry of such confirmation by the court, the clerk shall make out and certify to the commissioners a copy of such assessment roll, and shall also make out and deliver to the commissioners separate copies of such parts thereof, pertaining to the land situated in other counties, which shall be recorded in the recorder's office of the respective counties, in which the lands are situated, and shall be notice of the lien thereof to all persons.

Sec. 23. TREASURER—BOND.] The commissioners shall, after the confirmation of said assessment roll, and before any collections shall have been made by them, appoint a treasurer, who shall not be one of their number, who shall execute a bond to the people of the State of Illinois for the use of all persons interested, in a sum of not less than twice the amount of assessments that may be in his hands during his term of office, with such sureties as may be approved of by the judge of said court, conditioned for the faithful performance of his duties as treasurer of said drainage district, and that he will safely and faithfully account for all money that by virtue of his said office shall come to his hands. Which said bond when approved by the court shall be kept and preserved by said commissioners, and suits may be maintained upon the same by them upon any breach of its conditions.

Sec. 24. DUTIES—TERM OF OFFICE.] It shall be the duty of said treasurer to keep proper books to be furnished him by the commissioners, in which he shall keep an accurate account of all moneys received by him, and of all disbursements of the same; he shall pay out no money, except upon the order of a majority of the commissioners, and shall carefully preserve on file all orders for the payment of money given him by the commissioners, and shall turn over all books, papers, vouchers, moneys and other property belonging to and in his hands, as such treasurer, to his successor in office. His term of office shall be two years, but he may be at any time removed by the court upon petition of a majority of the commissioners, or for good cause shown. He shall receive, as a compensation for his services, a sum fixed by the commissioners before his appointment.

Sec. 25. COMMISSIONERS—NOTICE OF ASSESSMENT.] The commissioners, upon receiving such certified copy of such assessment roll, or the treasurer of such district, shall immediately cause a notice to be published for three weeks, in the manner required in section three of this Act, in substance as follows:

Notice is hereby given to all persons interested, that an assessment (or

installment of.....per cent of the assessment, as the case may be) is now due for drainage purposes upon lands lying within the.....drainage district, in the county of.....and State of Illinois, and the same must be paid to the undersigned commissioners of said drainage district (or to....., treasurer of said district at his office in....., as the case may be), on or before the.....day of....., 19...; and in default of such payment, the several tracts of land upon which said assessment (or installment, as the case may be), remains unpaid, will be sold according to law, to pay the amount of such assessment (or installment) and costs.

Dated this.....day of....., 19...

.....
Commissioner (or Treasurer).

In case the assessments made are ordered by the county court paid in installments, said commissioners or treasurer shall give a like notice, as near as may be, of any installment or installments immediately after such installment or installments becomes due and payable.

In case of "annual amount of benefits" in drainage and levee districts, as is required by section forty-two (42) the commissioners shall give notice in a similar manner immediately after the first day of September of each year stating what part of the "annual amount of benefits" will be collected for that year, which notice may be in substance as follows:

Notice is hereby given to all persons interested, that the "annual amount of benefits" (or.....per cent of the "annual amount of benefits," as the case may be), is now due for drainage and levee work for the year commencing September 1, A. D. 19..., upon land lying within the..... drainage and levee district, in the county of.....and State of Illinois, and that the same must be paid to the undersigned commissioners of said district (or to....., treasurer of said district, at his office in....., as the case may be), on or before the.....day of....., 19..., and in default of such payment, the several tracts of land upon which said "annual amount of benefits" (or.....per cent of the "annual amount of benefits," as the case may be), remains unpaid, will be sold according to law, to pay the amount of the same and costs.

Dated this.....day of....., 19....

.....
Commissioners (or Treasurer).

Which notice shall be a sufficient demand for any assessment or installment that may be due.

Sec. 26. DELINQUENT ASSESSMENT—RETURN—SALE.] If the assessment or any installment or installments thereof, or annual amount of benefits, due upon said lands, shall not be paid on or before the day named in the notice given in section twenty-five (25) of this Act, it shall be the duty of said commissioners, if they have not appointed a treasurer as aforesaid, and

if so, then of said treasurer, to make out a certified list of such delinquent lands upon which the assessment, or any installment or annual amount of benefits remains unpaid, and the same be by him or them, on or before the tenth day of March next, after the same have become payable, returned to the county collector of the county or counties in which said lands shall lie; and when the same shall lie in different counties a separate return shall be made for each county of the delinquent lands therein; and it shall be the duty of the county collector to whom any such returns have been made, to transfer such returns to the tax books in his hands, setting down therein in proper order the several tracts of the real estate, town lots and blocks so returned, and setting opposite the respective tracts of real estate, lots and blocks, in proper columns prepared for that purpose, the amount of assessment, installment or installments or annual amount of benefits against each tract of real estate, lots and blocks, and the like proceedings shall be had and with the like force and effect in the collection of such delinquent assessment or assessments, or installment or annual amount of benefits unpaid, with interest, and the sale of said real estate, lots, blocks and lands for non-payment thereof as in ordinary collections of State and county taxes by county collectors and of sale of real estate by them for such non-payment and of redemption from such sales. Nothing in this Act contained shall be construed to affect or impair any assessment or return of lands delinquent for assessment heretofore made under any law of this State.

Sec. 27. PAYMENT BEFORE SALE.] Notwithstanding the returns of such delinquent list, the said commissioners, or their treasurer, shall be authorized to receive payment of any such delinquent assessments and costs, and may give receipts for the same, but shall keep a memorandum of the same, and on or before the day of sale fixed by said county collector for the sale of such lands, shall present said memorandum, or list, to said county collector or collectors, for the purpose of having the same checked or marked paid on the delinquent list in his hands, and all amounts collected by the said county collector, by sales or otherwise, after deduction of his fees, shall be paid to the commissioners on demand.

Sec. 28. NEGLECT TO PAY ASSESSMENT OR INSTALLMENT.] In case the owner or owners of any lands lying in any district, heretofore or hereafter organized, and which are assessed, fails or neglects to pay any assessment or assessments, installment or installments, tax levy or levies when due, and the same be not collected on or before the annual sale of lands for non-payment of taxes, the commissioners of such drainage district may file a petition or bill in the circuit court of the county in which the land or property upon which such assessment, installment or levy has not been paid, for a foreclosure of such lien; and the commissioners may proceed in the corporate name of the district to foreclose such lien in like manner and with like effect as in foreclosure of mortgages. Any decree rendered in such court may be

enforced and collected as other decrees or judgments in the same court. The remedy provided in this section for the collection of delinquent assessments or taxes shall not be construed to abridge or in any manner interfere with the right and power to enforce collection of any delinquent assessment or tax in the manner provided by the revenue laws of this State, or other provisions of this Act, but the remedy herein provided shall be taken and held as an additional means to enforce payment of such delinquent assessment or tax.

Sec. 29. ACT TO BE LIBERALLY CONSTRUED.] This act shall be liberally construed to promote the ditching, drainage, and reclamation of wet or overflowed lands; and collection of assessments shall not be defeated by reason of any omission, imperfection or defect in the organization of any district, or in any proceedings occurring prior to the judgment of the court, confirming the assessments of benefits and damages; but said judgment shall be conclusive that all prior proceedings were regular and according to law.

ARTICLE III.

POWER TO BORROW MONEY.

Sec. 30. COMMISSIONERS' POWER TO BORROW MONEY.] The commissioners may borrow money not exceeding ninety per cent of the amount of assessment unpaid at the time of borrowing, for the construction of any work which they shall be authorized to construct, or for the payment of any indebtedness they may have lawfully incurred under the provisions of this act, and may secure the same by notes or bonds, bearing interest at the rate of not exceeding six per cent per annum, and not running beyond one year after the last assessment or installment of assessment on account of which the money is borrowed shall fall due, which notes or bonds shall not be held to make the commissioners personally liable for money borrowed, but shall constitute a lien upon the assessment for the re-payment of the principal and interest thereof; or such bonds may be issued to the amount of ninety per cent of any one installment, and constitute a lien on such installment alone, falling due within one year after such installment becomes due, such installment shall be particularly designated in such bonds, and the county court, on petition of the commissioners may authorize the sale of said notes or bonds at not less than 90% of their par value: *Provided*, where the payment of any installment or installments of any assessment has been deferred in pursuance of section twenty of this Act, and the court shall find on the petition of the commissioners that it will be for the interests of the district that money should be borrowed to an amount exceeding ninety per cent of such installment or installments, the court on due hearing, may by order entered of record, authorize the borrowing of money to such an amount in excess of ninety per cent of such installment or installments as the court may find to

be advisable. And the county court may, on the petition of the commissioners, authorize them to refund any lawful indebtedness of the district authorized by and created under this Act, or any former Act, by taking up and cancelling all outstanding notes and bonds of such district, issued under this Act, or any former Act, as fast as they become due, or before they shall become due, if the holders thereof will surrender the same, and to issue, in lieu thereof, new notes or bonds of such district, payable on such longer time as the commissioners may think proper, not to exceed in the aggregate the amount of all notes and bonds of such district then outstanding, and the unpaid accrued interest thereon, and the court shall have power, on the petition of the commissioners to order that the collection of any one or more, or all of the installments of the assessments for benefits on account of which the money was borrowed, be postponed to such time as the court may consider proper and reasonable, when the same shall become due and payable; and such installment or installments, so postponed shall bear interest until they shall become due, at the rate of eight (8) per cent per annum, unless otherwise ordered by the court, and after they become due they shall bear interest at the rate of eight per cent per annum: *Provided*, that such bonds and notes shall be made due and payable within one year after the last installment of the assessment postponed, as aforesaid, shall become due. The court shall have the power to make all needful orders to carry into effect the provisions of this Act, and no irregularity in the proceedings, either before or after the organization of the district or in the assessment of benefits, or in the extension of time for the payment of the same, shall in any manner affect the validity of the bonds or coupons issued in pursuance of this Act.

Sec. 31. BONDS—HOW ATTESTED, ETC.] Each bond issued as provided for by section thirty (30) of this Act shall be attested by the clerk of the county court, and said clerk shall also make a certified statement thereon, affixing his seal of office thereto, of the total amount of assessments and rate of interest it bears, pledged for the payment of said bonds and other bonds, if any issued; the date, number, denomination and time due of all bonds issued which are a lien upon the assessments or installments of assessments of the district; when the assessments were confirmed by the county court, and the number of acres of land in the district against which said assessments were made.

ARTICLE IV.

CHANGES IN PLANS AND ASSESSMENTS, PAYMENT OF DAMAGE AND CONTRACTS FOR WORK.

Sec. 32. CHANGE IN CONSTRUCTION.] Whenever the commissioners of any drainage district organized under the provisions of this Act shall be of the opinion that it would be for the best interest of said district that a change,

or changes, should be made in the method of construction of any part of the proposed work of such district, or in the route of any proposed ditch, ditches, levee or levees or in the size, capacity or plan of any such proposed work, the said commissioners shall file their petition in the county court of the county in which said district was organized, which petition shall set forth the nature of the proposed change or changes in plans, together with an estimate of the additional or decreased expense of such change or changes, and which shall be signed and sworn to by such commissioners, or a majority of them, and to which petition shall be attached, the affidavit of some credible person or persons, giving the names and post office addresses of all owners of lands in said district, not residents of said county. Upon such petition being filed, the court shall set the same for hearing, on some day not less than two weeks or more than four weeks from the filing thereof, and the clerk of said court shall proceed to give two weeks' notice of such hearing, in the manner provided in section three (3) of this Act. Upon the hearing thereof, if the court shall find that the said proposed change, or changes, does, or do, not materially affect the general nature and character of the proposed work of said district, and does, or do, not decrease the general efficiency of the same, the court shall enter an order to that effect and shall, at the same time make a finding as to the additional amount that will be required to make such change or changes, or the decreased amount that will be required if such change or changes be made. In case the court shall find that such change or changes should be made and that additional expenditures will be required to make such change or changes, the court may order the same paid from the general funds of said district, or may order the commissioners to return a roll of additional assessments or benefits against the lands of said district for the additional amount required. In case the court shall order an additional assessment of benefits, or an assessment of benefits and damages, the commissioners and court shall thereafter proceed in the return and confirmation of the same in conformity with the provisions of Sections 17, 18, 18½, and 19 of this Act. In case the court shall find that the making of such change or changes will decrease the expense of the proposed work of said district, the court shall enter an order abating such proportion of the assessment of benefits as shall have been theretofore made in such uniform proportions, as such change or changes shall render unnecessary to be expended. The court may, for good cause shown, continue the hearing on such petition from time to time, and any person interested may appear and resist the application for such proposed change or changes. The court may, on the hearing of said petition, make such other or further order in the premises as the circumstances may require in order to do justice to the petitioners and the land owners and persons in said district.

Sec. 32½. ABANDONMENT OF DRAIN.] At any time before the contract shall have been made for the construction of any drain, ditch, levee or

other work provided for in the report of the commissioners, or the order of the court made in pursuance thereof, which is sought to be abandoned, as hereinafter provided, upon petition of a majority of the adult land owners of the district representing one-half or more of its area, the county court may, if upon due inquiry it shall be satisfied that justice towards a majority of the land owners of said district requires it, direct the commissioners to abandon any drain, ditch, levee or other work, or any part thereof, mentioned in such report or order. Upon the filing of any such petition it shall be set down for hearing by the court, and notices of the filing of such petition, and of the general nature of the relief sought by the petitioners, shall be given by the clerk of the court in which such petition is filed for the length of time and in the manner (as far as applicable to the nature of the proceedings) required by Section three (3) of this Act. The court may, for good cause, after the proof of notice as aforesaid, continue the hearing of such application from time to time, and any person or persons interested may appear and resist such application; and the court, after a full hearing of all material facts pertaining thereto may make such order in the premises as shall appear to the court to be just. If the court shall determine that any portion of the proposed work shall be abandoned, it shall ascertain to what extent the cost of such proposed work shall be diminished thereby; and if the assessments for benefits shall have been made, such portions of said assessment shall be abated in such uniform proportion as such change of plan shall render unnecessary for the completion of such works according to such modified or altered plans and if any lands shall have been assessed by the commissioners which, on account of such change of plans, will be wholly deprived of the benefits contemplated in the original plans, the court shall order that the entire assessments against such lands be abated. If such order shall be made after the assessments shall have been collected, the court shall order such proportion of said assessments as may be abated to be refunded to the persons who may have paid the same or their lawful representatives, and for noncompliance with such order, the commissioners and the treasurer of said district, respectively, and their sureties shall be liable upon their respective bonds. And the court may make any other or further order in pursuance of the objects of this section of this Act, as justice to all persons whose interests may be affected by it may require. And at any time before the contract for the construction of the proposed works shall have been made, upon presentation to the County Court of a petition signed by a majority in number of all the land owners of such district and owning more than one-half in area of lands in the districts to which the petitioners belong, praying that the whole system of proposed works may be abandoned and the district abolished, the court shall enter upon its record an order granting the prayer of such petition upon condition that the petitioners pay all court costs and all debts and expenses necessarily and properly incurred by said district

up to the time of filing of such petition for abandonment, said expenses and debts and costs to be ascertained and fixed by the court as part of its order, within thirty (30) days from the rendition of said order. If such petitioners fail to comply with such order it shall be considered after the expiration of said thirty (30) days as of no force or effect whatever. If the district be abolished under this session assessments collected shall be referred to the persons who have paid the same, or their representatives, provided that the petitioners shall have the right to withdraw from said petition at any time before the petition is finally acted upon by the court.

Sec. 33. PAYMENT OF DAMAGES.] All damages over and above benefits to any tract of land, shall be payable out of the amount assessed against other lands assessed for benefits, and shall be paid or tendered to the owner thereof before the commissioners shall be authorized to enter upon his land for the construction of any work thereon. In case the owner is unknown, or there shall be a contest in regard to the ownership of the land, or the commissioners cannot for any reason safely pay the same to the owner, they may deposit the same with the clerk of the court and the court may order the payment thereof to such party as shall appear to be entitled to the same. The damages assessed under this Act in favor of any tract or tracts of land in such district, shall be in full compensation to the owners thereof, their heirs or assigns, for the perpetual right of way, as located by the commissioners over such lands, of any ditch or ditches, open or covered, levee or other work including the right of the commissioners, their employees or contractors with teams, tools or machinery to enter upon such lands, and construct such work, and if necessary, to repair or enlarge the same, and any person who shall wilfully prohibit or prevent any of the aforesaid persons from entering such lands for the purpose aforesaid, shall be fined in a sum not to exceed twenty-five dollars (\$25.00) per day, for such hindrance, to be collected as other fines.

Sec. 34. LETTING CONTRACTS—ADVERTISING FOR BIDS.] The commissioners, when qualified in pursuance of this Act, may do any and all acts that may be necessary in and about the surveying, laying, constructing, repairing, altering, enlarging, cleaning, protecting and maintaining any drain, ditch, levee or other work for which they have been appointed, including all necessary embankments, protections, dams and side drains, clearing out and removing obstructions from natural or artificial channels or streams within or beyond the limits of the drainage district, procuring or purchasing riparian rights by agreement with the owners thereof, and may use any money in their hands arising from assessments for that purpose: *Provided*, that in all cases where the work to be done is the construction of the principal work, the cost of which will exceed five hundred dollars (\$500.00), the same shall be let to the lowest responsible bidder, and the said commissioners shall advertise for sealed bids by notice published at least once in some newspaper

issued in the county in which the petition is filed, said publication to be published at least twenty days before the letting, and if there be no newspaper issued or published in said county, then in the nearest newspaper; which said notice shall particularly set out the time and place, when and where, the sealed bids will be opened; the kind of work to be let, and the terms of payment. Said commissioners may continue the letting from time to time, if in their judgment the same shall be necessary, and may reserve the right to reject any and all bids. And said commissioners shall not, during their term of office, be interested directly or indirectly in any contract for the construction of any ditch, drain, or levee, in such drainage district, nor in the wages of or supplies to men or teams employed on any such work in said district: *Provided, further*, that no levee, drain, ditch or other work authorized to be constructed or made under this Act shall be constructed or made in such a manner as to destroy or impair the usefulness or prevent the public use of any bay or harbor, or body of water used as a harbor, connected with any navigable stream.

Sec. 35. CREDIT ON ASSESSMENT FOR WORK.] In case any person assessed for benefits, contracts to do any work, and said work is done according to contract, the commissioners shall give said person a receipt for so much of said assessment as said work amounts to, and said receipt may be received by the treasurer as payment of so much of said assessment: *Provided*, that when bonds have been issued by said district such contractor shall have an order on the funds in the hands of the treasurer for said amount.

ARTICLE V.

USE OF MONEY AND ADDITIONAL ASSESSMENTS.

Sec. 36. MONEY TO BE USED UNDER DIRECTION OF COURT.] Said commissioners may use money arising from the collection of assessments or coming into their hands as such commissioners for the purpose of

1. Compromising suits and controversies arising under this Act,
2. In the employment of all necessary agents and attorneys, in organizing said district,
3. For conducting other proceedings at law or in equity for the same, and
4. For the purpose of constructing or maintaining or repairing any ditches, drains, or levees within said district or outside of said district, necessary to the protection of the lands and complete drainage of the same within said district.

Provided, that the commissioners shall use such money under the direction or approval of the court.

Sec. 37. ADDITIONAL ASSESSMENTS.] Assessments from time to time may be levied within any district when it shall appear to the court

1. That the previous assessment or assessments have been expended, or
2. Are inadequate to complete such work, or
3. Are necessary for maintenance or repair, or
4. When it shall become necessary for the construction of one or more pumping plants or other additional work, or
5. To pay obligations incurred for the current expenses of said district or in the keeping in repair and protection of the work of said district, or
6. The completion of any work already commenced within any drainage district to insure the drainage or protection of the lands in said district under the direction and order of the court, or
7. To pay obligations incurred for the completion of any part of the work of said district, as originally planned, contracted for and already commenced within any drainage district to insure the protection or drainage of the lands in said district, or
8. When it shall become necessary to realize funds in order that any district organized under this or other Acts may avail itself of financial assistance from any appropriation made by the government of the United States for the purpose of repairing, enlarging or strengthening any levee or levees adjacent to or near any river.

On a petition of the requisite majority of land owners, hereinbefore defined, or on the petition of the commissioners accompanied by an itemized statement of accounts made by the commissioners under oath showing:

- (a) The moneys received by the district,
- (b) The manner in which they have been expended,
- (c) The plats and profiles of any additional work,
- (d) The estimated cost of the same.

Two weeks' previous notice of the time set for the hearing on said petition in the manner required by section three (3) of this Act shall be given and on the hearing of said petition the court may grant or deny the prayer of the same and may make such other order as the case shall require.

If the court finds an additional assessment should be made, it shall cause a jury to be impaneled to make said assessment, as well as an assessment for an annual amount of benefits for maintaining and operating such pumping plant or plants and for keeping such additional work in repair, with like proceedings, and notice as near as may be, as in case of original assessments of damages and benefits under this Act and such additional assessment or assessments when made shall have the same force and effect and be collected in the same manner as original assessments.

SEC. 38. INCLUSION OF VOID OR UNPAID ASSESSMENTS.] In making additional assessments the jury may consider any prior assessment or assessments, against any land which are void and unpaid, by reason of some omis-

sion, clerical error, mistake, or for want of proper notice to the owner thereof, or on account of other irregularity of proceedings not affecting the merits of such prior assessments and may include the same or any part thereof with such other assessments.

Sec. 39. PROCEEDINGS WHEN ASSESSMENT IS INVALID AS TO ONE OR MORE TRACTS.] Whenever it shall appear to the court that any proceedings for the organization of a drainage district, or any assessment of damages or benefits under this Act, or any law of this State is invalid as to one or more tracts of land jointly or severally owned, situated in such district or any tract of land has been omitted from such assessment by reason of clerical error or other mistake, or want of the proper notice or notices, as required by such Act or law, such want of notice shall not invalidate such organization, neither shall such assessment of benefits be lost to the district; but the commissioners of such district may file a petition against the owner or owners, his heirs or assigns, of such lands irregularly assessed or omitted in said court, describing in such petition the boundaries and name of the district, the land owned by defendants, the amount of damages and benefits assessed in favor of and against such lands, reciting such irregularity of notice and omissions, and praying the defects and omissions may be cured, and such assessments be made valid, and that the lands omitted, if any, may be assessed, or made a part of the district, as the case may be.

Sec. 40. PROCESS AND HEARING THEREON.] Upon the filing of such petition, process of summons shall be issued thereon, made returnable to said court, and served ten days before the next succeeding term thereof, or continued, as the case may be, for service, in the manner now provided by law for issuing and service of summons in chancery cases; and in case the defendants or either of them, are non-residents of this State, like proceedings and practice shall be had, and notice by publication shall be given as provided by such law in chancery cases. In case any defendants are minors, the court shall appoint a guardian *ad litem* who shall appear and defend in behalf of such minors; and every defendant served or notified as required in this Act shall by his answer show why the prayer of the petition should not be granted; and in default of such answer the court shall give judgment according to the prayer of such petition. In case the defendants file such answer, the court, on the trial of said cause, shall hear oral or written evidence, and give judgment therein, as in cases of equity, and may grant the prayer of such petition: *Provided*, in case the petition asks to make valid an assessment of damages or benefits, or to make assessments in favor of or against lands omitted, the defendant, if he demands it, shall be entitled to a jury to view the premises, and make assessments *de novo*, or make assessments omitted, as to the lands named in the petition, and a special assessment roll shall be made and filed and a jury impaneled and sworn and shall proceed in the manner provided by this Act, as near as may be, for making assess-

ments and such further proceedings and confirmation shall be had therein, as provided in this Act, in cases of other assessments; and the defendants may appeal from the confirmation of the verdict of the jury or judgment of the county court, upon the same conditions provided by this Act for appeals from judgments in other cases of assessment of damages and benefits.

ARTICLE VI.

MAINTENANCE OF WORK AFTER COMPLETION.

Sec. 41. ASSESSMENT FOR REPAIRS.] The amount assessed for keeping any levee or other work of the district in repair, shall not in the aggregate amount to a sum in any one year, greater than would be produced by 30 cents per acre on all lands within said district. In case such assessment of annual benefits is not made at the time of the original organization of said district or the same is thereafter found to be insufficient, the same may be provided for, or increased in the same manner as herein provided for the levying of additional assessments in such districts.

In case the petition shall set out that a levee or ditch has been made under any law of this State and prays for an assessment of benefits to repair and keep in repair said levee or ditch, the commissioners shall cause to be made an assessment of benefits which said lands will sustain by repairing said levee or ditches, and also the "annual amount" of benefits which said lands will sustain by keeping said levee or ditch in repair thereafter and such assessment of benefits shall be made in the same manner provided by sections seventeen (17), eighteen (18), eighteen and one-half ($18\frac{1}{2}$), and nineteen (19) of this Act, but in all other respects the commissioners shall comply with the provisions of this Act, so far as the same may be applicable thereto: *Provided*, that in all cases where the amount of benefits assessed, and the assessment of benefits to repair said levees, ditches or drains, heretofore constructed under any law of this State are insufficient to complete the ditches, drains or levees embraced in the proceedings, the "annual amount of benefits" assessed to keep said levee or ditch in repair after making all necessary repairs and paying other necessary expenses of maintenance for any year, may be applied to complete the ditches, drains or levees embraced in the proceedings, and to raising, strengthening and protecting said ditches, drains and levees, when required to protect the lands embraced in the drainage and levee districts organized under this Act, from inundation and overflow, and in paying interest on any other notes or bonds issued under this act.

Sec. 42. ANNUAL AMOUNT OF BENEFITS—WHEN PAYABLE—PROCEEDING—REPORT—MAY BORROW MONEY—INTEREST.] In case where a levee or ditch has been heretofore built under any law of this State, or may hereafter be built under the provisions of this Act, the annual amount of benefits for

keeping the same in repair shall be due and payable on the 1st day of September annually, and shall be a lien on the lands upon which said assessments are made, from and after the confirmation of the report. The court in which such proceedings are had shall require from said commissioners a report of the condition of the levee or ditch at its July term of each year, together with their estimate of the amount necessary to keep the levees or ditches in repair, pay all incidental and necessary expenses for the ensuing year, and the amount necessary to complete the ditches, drains or levees embraced in the proceedings and to raise, strengthen or protect said ditches, drains or levees, when completed, and in constructing additional ditches, drains or levees when required to protect the lands embraced in the drainage and levee district organized under this Act, from inundation and overflow; and if the court shall find that a less amount will be required for such ensuing year than the whole amount of the assessment for the year, then the court shall by an order fix the amount to be paid for such year and only that amount shall be collected, and the excess of such assessment over and above the amount so fixed by said order for said year shall be remitted by law, and shall not thereafter be collected: *Provided*, that the amount to be collected under the order of said court shall not in the aggregate amount in any one year, to a sum greater than would be produced by a levy of thirty cents per acre on all the lands within said district; except in districts which now have, or may hereafter have, pumping plants, in which districts the annual amount of benefits collected each year shall be a sum sufficient to keep the levees, ditches, drains and other works of said district in repair and to maintain in operation such pumping plant or plants: *Provided further*, that in all cases where the ditches, drains or levees constructed or repaired under this Act or any former act are in danger of being impaired, injured, broken or destroyed by overflow or otherwise, and a part of the annual amount of benefits for protection and keeping the same in repair for the year in which said ditches, drains or levees are so threatened, has been remitted by order of the court as herein provided, or when the annual amount of benefits for protecting and keeping the same in repair for any year is insufficient, the commissioners of drainage and levee districts, operating under this Act, may borrow money on the annual amount of benefits becoming due the 1st day of September, following the time when said ditches, drains or levees are so threatened, to the extent of two-thirds of said annual amount of benefits and may secure the same by notes or bonds of the drainage and levee districts bearing interest at the rate of six per cent per annum, and not running beyond one year from the date of issue, which notes or bonds shall not be held to make the commissioners personally liable for the money borrowed, but shall constitute a lien upon the annual amount of benefits falling due thereafter for the repayment of the principal and interest thereof.

ARTICLE VII.

ANNEXING LANDS TO ORGANIZED DISTRICTS.

Sec. 43. ASSESSING LANDS BENEFITED OUTSIDE THE DISTRICT.] Any land lying outside of the drainage district as organized, the owner or owners of which shall thereafter make connection with the main ditch or drain or with any ditch or drain within the district as organized or whose lands are or will be benefited by the work of such district, shall be deemed to have made voluntary application to be included in such drainage district; and thereupon the commissioners shall make complaint in writing, setting forth a description of such land or lands benefited, and amount of benefits; the name of the owner or owners thereof, also a description of the drain or ditch making connection with the ditches of such district, as near as may be; and file said complaint in the county court or before a justice of the peace. The court or justice of the peace shall fix a day, not less than fifteen days from such filing, when he will hear such complaint, and thereupon the commissioners shall give ten days' notice thereof in writing; said notice shall embrace a copy of such complaint, and service thereof shall be either by reading or delivering a copy thereof to such owner or owners, or by publishing a copy of said petition and posting copies thereof within the territory sought to be annexed in the same manner as provided by Section 3 of said Act; and affidavit of such service shall be evidence thereof. At the time fixed, or at a time continued from such time fixed, the court or justice of the peace, shall hear said cause, and if the complaint is before a justice of the peace, and judgment is rendered in favor of said district, he shall record a copy of said complaint, and service of notice thereof together with his judgment thereon upon his docket, and if the district was organized before the county court, he shall transmit a certified copy of such complaint and judgment to the clerk of such court who shall file and record the same, or if the complaint was heard by the county court, in which such district was organized and judgment given in favor of said district, a record of such judgment giving a description of such lands annexed shall be made, and such lands described in the complaint in either case, shall be deemed a part of such district and shall be assessed as other lands therein. The assessments of benefits against such lands so added to aid district may be made at any time the commissioners may deem proper; and the assessment roll thereof shall be filed and recorded and proceedings thereon had as in other cases; or such lands may be assessed when all lands throughout the district are assessed:

Sec. 44. USE OF DISTRICT DRAINS BY OWNERS WITHIN THE DISTRICT. VOLUNTARY ANNEXATION BY OUTSIDE OWNER.] Nothing in this Act shall be construed to forbid land owners within the district to more completely drain their lands by using the common drains as outlets to lateral drains; and the owners of land outside the drainage districts or another drainage district

may connect with the ditches of the district already made, by the payment of such amount as they would have been assessed if originally included in the district, or if such connection shall, by increase of water, require an enlargement of the district ditches, then the outside owners of land so connecting, or other drainage district, as may be, shall pay the cost of such enlargement. If individual land owners outside the district shall so connect, they shall be deemed to have voluntarily applied to be included in the district, and their lands benefited by such drainage, shall be treated, and assessed like other lands within the district.

Drainage commissioners may at any time enlarge the boundaries of their districts by attaching new areas of land which are involved in the same system of drainage and require for outlets the drains of the district made or proposed to be made, as the case may be, on petition of as great a proportion of the land owners of the area to be added as is required for an original district. All changes thus made in the district shall be duly noted and shown upon the map, and recorded in the drainage record. The lands thus added to the district shall be assessed with their fair proportion of the costs of the work done, or to be done, in like manner, and upon the same basis as it would have been made had the new area been included in the district at its organization.

ARTICLE VIII.

SUB-DISTRICTS.

Sec. 45. CONSTRUCTING ADDITIONAL DITCHES—PROCEEDINGS.] If, after an assessment of lands throughout the district has been made for the purpose of constructing drains or ditches, or enlarging or repairing the main drains or ditches of said district, according to the profiles, plans and specifications of the commissioners, as reported and confirmed, there remain lands in particular localities in any original district which are in need of more minute and complete drainage, and it shall appear to the commissioners that, in their judgment, additional ditches, drains, outlets, levees, pumping plants, or other work are needed in order to afford more complete drainage, they may prepare a special report as hereinafter provided and file the same and organize a sub-district, in the manner hereinafter set forth without the necessity of a petition of the land owners therefor, and in all cases where, upon written application to the commissioners signed by a majority in number of the adult land owners in such locality owning in the aggregate more than one-third of the land affected or by the adult land owners of the major part of the land in such locality who constitute one-third or more of the owners of the land affected, it shall appear that additional ditches, drains, outlets, levees, pumping plants or other work are necessary in order to afford more complete drainage to such locality, it shall be the duty of such commissioners to examine such lands, and lay off and make plans, profiles and specifications of

such additional work, and an estimate of the cost of the same and make a special report thereof, which special report whether filed on petition of land owners or not, shall describe all of the lands which will be either benefited or damaged by such additional work, together with the names of the owners, when known; and said commissioners may use any money in their hands not otherwise appropriated to pay the necessary expenses of preparing said special report; *provided*, said sum to be expended shall in no case exceed the sum of \$500.00; the special report when prepared by the commissioners shall be filed with the clerk of the county court, and the commissioners shall give to all persons whose lands will be either benefited or damaged, whether they signed an application for additional work or not, three weeks' notice of the filing and hearing of such report in the manner required by Section three (3) of this Act; said notice shall state that the commissioners will appear before the county court at a day mentioned in said notice, and ask said court for a confirmation of such special report; and upon said hearing the court shall pass upon said report and may permit the same to be amended, and if said report is confirmed and approved by the court, a special assessment of benefits and damages shall be made upon all the lands benefited or damaged by the proposed work, in the manner provided for the making of the original assessments for the benefits and damages by this Act; and like proceedings shall be had thereon as in other cases and assessments of benefits and damages provided by this Act; and said commissioners shall have the power to cause to be made additional assessments of benefits and damages for the same purposes and with like proceedings as in cases of additional assessments of benefits and damages made for original districts under this Act; and the said commissioners may cause to be levied an assessment of annual benefits in said sub-district in the same manner as annual benefits are levied in original districts under this Act: *Provided*, that if said sub-district does not own or operate a pumping plant, such annual benefits shall not in any one year amount to more in the aggregate than a sum which would be produced by the levy of thirty cents per acre on all the lands within said sub-district.

The affidavit of any of the commissioners, or any other credible person, of the posting and mailing thereof affixed to a copy of said notice shall be sufficient evidence of the posting and mailing of said notices, and the certificate of the publisher of the newspaper in which said notice was published shall be sufficient evidence of the publication of such notice.

Upon confirmation of said special report by the court, it shall be the duty of the court to declare all the lands found to be affected by the work proposed by said special report to be organized into a sub-district, and all assessments received and collected in such sub-district, for the work of such sub-district, shall be kept as a separate fund belonging to such sub-district, and said commissioners shall have the power, if necessary, to issue bonds

against any assessment or assessments in said sub-district in the same manner as bonds are issued in original districts.

The commissioners of the principal district shall be ex-officio commissioners of the sub-district.

Any lands lying outside of any sub-district as organized, the owner or owners of which shall hereafter make connections with any ditch or drain within any sub-district, or whose lands are or will be benefited by the work of such sub-district, shall be deemed to have made voluntary application to be included in such sub-district, and thereupon the commissioners shall make complaint as provided in Section 43 of this Act as to lands lying outside of a drainage district as organized, and like proceedings shall be made thereon as in cases of complaints made under said Section 43.

ARTICLE IX.

DRAINAGE COMMISSIONERS, THEIR ORGANIZATION, POWERS AND DUTIES AND SUCCESSION.

Sec. 46. OFFICIAL OATH.] Before entering upon the duties of their office all commissioners shall take and subscribe to an oath to faithfully discharge the duties of their office without favor or partiality, and to render a true account of their doings to the court, by which they are appointed or which has jurisdiction over the district at the time such report is due whenever required by law or order of the court, which oath shall be filed with the clerk.

Sec. 47. CHAIRMAN-SECRETARY.] They shall elect one of their number chairman, and may elect one of their number as secretary.

Sec. 48. QUORUM.] A majority of the commissioners shall constitute a quorum, and a concurrence of a majority of their number in any matter within their duties shall be sufficient.

Sec. 49. DRAINAGE RECORD.] The commissioners shall, at the expense of the district, keep a well bound book, to be known as the "drainage record," which shall at all times be open for inspection to parties interested, in which one of their number, as secretary, shall record the proceedings of every meeting thereof. They shall hold such meetings on the first Tuesdays of March, May, July and September of each year, or oftener, if necessary. They shall make brief memoranda in such record of all their transactions concerning the district. If bonds have been issued, and sold, as a lien on any particular installment of assessments, or a general lien on all; or contracts have been let on any section or division of work; or orders issued on the treasurer; or materials or tools purchased; or warrants for service of a commissioner issued by the clerk; or sums paid, by order, for work done; all such proceedings and any other particular matter or transaction of such commissioners shall be carefully entered upon such records, and the dates, amounts and proper descriptions of such doings, shall at all times be observed

in making such memoranda. Said commissioners shall also take and preserve proper vouchers for all orders given by them on the treasurer.

Sec. 50. REPORTS OF COMMISSIONERS.] The commissioners shall as often as once in each year after their appointment, and as much oftener as the court shall require, make a report to the court, showing the amount of money by them collected and the manner in which the same has been expended; and upon the filing of such report, the court shall set a time, not exceeding three weeks from such filing, when such report shall be heard; and the commissioners shall give at least ten days' notice thereof, by posting written or printed notices, in not less than four of the most public places in the district, and one at the door of the court house of the county in which said district was organized. Upon the time fixed the court shall hear said report and all objections thereto, or may continue such hearing to another time fixed; and upon hearing such report, may require evidence, to be produced by the commissioners, in support thereof, and if found correct, may approve such report. Upon the failure of the commissioners, or either of them, to make such report, to the satisfaction of the court, as required by this section the court on the application of any person interested, or without such application, shall remove such commissioner or commissioners from office.

Sec. 51. BOND OF COMMISSIONERS.] The commissioners appointed by virtue of this chapter, shall not collect or receive any money for the purposes herein specified, until they shall have given bond, payable to the people of the State of Illinois for the use of all persons interested, in a sum not less than twice the amount of the assessment for benefits which is payable in any one year, or which may come into their hands or under their control during such year, with such security as shall be approved by the judge of the court, conditioned for the faithful application of all moneys that may be received by them as such commissioners, and to make due account thereof to the court whenever required, by law or order of the court, and for the faithful performance of their duties as commissioners, which bond shall be filed in the court in which the proceedings are had. Such commissioners are hereby required to renew such bond, on or before the 15th day of September, each year, after the appointment of them or either of them.

Sec. 52. PAY OF COMMISSIONERS.] The commissioners shall hold all their meetings for the transaction of business at any place in the county or counties in which said district is located, and shall receive for their services the sum of five dollars per day, and their necessary traveling expenses for each day they shall be actually engaged in the business of their office. The commissioners shall present an itemized account, under oath, to the county court, of the amounts due them, respectively, which account shall be audited at least once a year by said county court, and certified by said court to their treasurer, to be paid by him on said certificate. But such itemized account

or accounts shall be subject to the approval of the court as provided by Section fifty (50) of this Act. The clerk of the county court shall receive for his services hereunder, such fees as are allowed by law for similar services in said county court.

Sec. 53. POWER OF COMMISSIONERS TO CONTRACT.] Upon the organization of said drainage district, it shall in its corporate name, by its commissioners from thenceforth, have power to contract and be contracted with, sue and be sued, plead and be impleaded and to do and perform, in the corporate name of said district, all such acts and things as may be necessary for the accomplishment of the purposes of this Act.

Sec. 54. POWER TO ENTER LANDS.] The commissioners from the time of their appointment may go upon the lands lying within said district for the purpose of examining the same, and making plans and surveys and after the organization of said district, and payment or tender of compensation allowed, may go upon said lands, with their servants, teams, tools, instruments, or other equipments, for the purpose of constructing such proposed work, and may forever thereafter enter upon said lands as aforesaid, for the purpose of maintaining or repairing such proposed work, doing no more damage than the necessity of the occasion may require; and any person or persons, who shall wilfully prevent or prohibit any of such persons from entering such lands for the purposes aforesaid, shall be fined any sums not exceeding \$25.00 per day for each day's hindrance, to be recovered in an action of debt in favor of such drainage district before any justice of the peace, or court of competent jurisdiction, which sum shall be paid into the treasury for the use of said district.

Sec. 55. POWERS OF EMINENT DOMAIN.] Drainage and Levee districts heretofore organized under any former Act, and drainage and levee districts hereafter organized under this Act, when it shall become necessary to construct drains, ditches or levees, either within or without said districts in order to protect the lands embraced in said drainage and levee districts from inundation and overflow, or repair, enlarge, raise, strengthen or protect drains, ditches or levees already constructed or in process of construction, may, by their agents and employees, enter upon and take possession of such lands, paying, if the owners of such lands and the commissioners of said drainage and levee districts cannot agree, the value of such lands taken and the amount of damages occasioned thereby, to any such lands or its appurtenances, and if such owners and commissioners of said drainage and levee districts cannot agree, then the value of such land either within or without said districts cannot agree, then the value of such land either within or without said districts and the damages occasioned thereto may be ascertained, determined and paid in the manner that may now or hereafter be provided by any law of eminent domain. And the commissioners of said drainage and levee districts when necessary to protect the

lands of the said districts, the drains, ditches or levees thereof, may put in such work as will protect the same and they may go beyond the bounds of the said district for that purpose.

Sec. 56. POWER TO COMPEL OPENING OF WATERCOURSE.] When any ditch drain or other work of enlarging any channel or watercourse is located by the commissioners on the line of any natural depression or watercourse, crossing the road of any railroad company where no bridge or culvert or opening of sufficient capacity to allow the natural flow of water of such ditch or water course, is constructed, it shall be the duty of the commissioners to give notice to such railroad company to construct or enlarge such bridge or culvert or opening in the grade of such road, for such ditch or ditches or other work, of the dimensions named in such notice, within twenty days from the service thereof; and any railroad company neglecting, failing, or refusing so to do, shall be liable to any owner of land in such district, for all damages to such land sustained by such neglect or refusal; and shall be liable to such district in the sum of twenty-five dollars (\$25) for each day such company shall have neglected or refused to construct such work, after the time fixed in such notice for constructing the same shall have expired, which damages or penalty may be recovered before a justice of the peace, if within his jurisdiction, or before any court of competent jurisdiction.

Sec. 57. POWER TO CLEAN OUT WATERCOURSE—MEANING OF DITCH.] The word ditch when used in this Act, shall be held to include any drain or watercourse, and the petition for any drainage district shall be held to mean and include any side, lateral spur, or branch ditch or drain, whether open, covered or tiled, or any natural watercourse into which such drains or ditches may enter for the purpose of outlet, whether such watercourse is situated in or outside of the district. And to secure complete draining of the lands within any drainage district, the commissioners are hereby vested with full power to widen, straighten, deepen or enlarge any such watercourse, or remove drift wood or rubbish therefrom whether such watercourse is situated in, outside of or below any drainage district; and, when it is necessary to straighten such natural watercourse by cutting of new channel upon other lands, the value of such lands to be occupied by such new channel, and damages, if any, made by such work may be ascertained and paid in the manner that is now or may hereafter be provided for by any law providing for the exercise of the right of eminent domain in force in this State. The expense of the work provided for in this section shall be paid from moneys arising from assessments upon lands within the district. This section shall apply to any and all drainage districts that have been heretofore, or may hereafter be organized under this Act.

Sec. 58. POWER TO MAINTAIN DREDGE BOATS.] Whenever the commissioners shall deem it necessary for their district to own, maintain and

operate one or more dredge boats for the construction and preservation of its drains, ditches and levees, they may with the approval of the county court then having jurisdiction, purchase, or build, and maintain and operate one or more dredge boats for the purposes aforesaid and pay for the same out of any funds of said district arising from any special assessment heretofore or hereafter levied for the construction and maintenance of the reclamation system of said district.

Sec. 59. REFUSAL, ETC. TO PERFORM DUTY.] If any commissioner shall refuse or neglect to discharge any of the duties imposed upon him, by virtue of this Act, he shall for every such refusal or neglect, be liable to the party aggrieved, for all damages sustained by him, and upon conviction, may be fined in any sum not exceeding one hundred dollars (\$100.00), and be removed from his office.

Sec. 60. REMOVAL OF COMMISSIONERS—FILLING VACANCIES.] The court may, for good cause, at any time, remove any commissioner appointed by it, and appoint another in his place, and may fill all vacancies caused by death, resignation, removal or otherwise.

Sec. 61. SUCCESSION OF COMMISSIONERS.] On the first Monday of September, in each district heretofore organized, and on the first Monday of September after any district may hereafter be organized under this Act, the county court shall appoint three commissioners for each respective district, one to serve one year, one two years, and one for three years from the date of the first appointment under this section, and on the first Monday of September of each year thereafter the said court shall appoint one commissioner of said district who shall hold his office for three years, and until his successor is chosen and qualified, but in all districts now organized or hereafter to be organized for the construction, reparation and protection of drains, ditches and levees for agricultural purposes, the court shall appoint as commissioner or commissioners, only such persons as shall be petitioned for by adult land owners representing a majority of the acreage embraced in the district: *Provided*, such petition is filed in said court on or before the first day of September aforesaid. In case such petition is not filed, as aforesaid, then said court, within ten days after the said first Monday in September, shall appoint some suitable person or persons as commissioner or commissioners of said district without such petition.

Sec. 62. CHANGE TO SINGLE COMMISSIONER.] At any time after the drains, ditches or levees, for the construction of which the district was organized, have been finally completed, the court may, on petition therefor, as aforesaid, dispense with two commissioners, and thereafter appoint for such district, in accordance with this Act, but one commissioner, such one commissioner to hold office for the term of three years from his appointment and until his successor is chosen and qualified, and he shall perform the duties and exercise the powers thereof vested and imposed upon the

three commissioners of such district. Whenever, upon the petition of one or more land owners of said district, it shall appear to the court that additional work is needed in said district, the court may again appoint three commissioners for said district.

ARTICLE X.

PENALTIES.

Sec. 63. PENALTIES FOR INJURING, ETC., ANY DRAIN.] Any person who shall wrongfully and purposely fill up, cut, injure, destroy or in any manner impair the usefulness of any drain, ditch or other work, constructed under this Act, or heretofore constructed under any law of this State, or that may have been heretofore, or may hereafter be voluntarily constructed for the purposes of drainage or protection against overflow may be fined in any sum not exceeding two hundred dollars, to be recovered before a justice of peace in the proper county, or if the injury be to any levee whereby lands shall be overflowed, he may on conviction in any court of competent jurisdiction, be fined in any sum not exceeding five thousand dollars; and shall be deemed guilty of a felony and imprisoned in the State penitentiary for a term of not less than one, nor more than five years, at the discretion of the court. All complaints under this section shall be in the name of the People of the State of Illinois, and all fines, when collected, shall be paid over to the proper commissioners, to be used for the work so injured.

Sec. 64. CIVIL LIABILITY FOR DAMAGES.] In addition to the penalties provided in the preceding section, the person so wrongfully and purposely filling up, cutting, injuring, destroying or impairing the usefulness of any such drain, ditch, levee or other work, by obstructing or filling up of any natural stream or outlet, within or beyond the drainage district shall be liable to the commissioners having charge thereof, for all damages occasioned to such work, and to the owners and occupants of land for all damages that may result to them by such wrongful act, which may be recovered before a justice of the peace, if within his jurisdiction, or before any court of competent jurisdiction.

ARTICLE XI.

MISCELLANEOUS.

Sec. 65. NO SECOND TAX—UPPER DITCH BENEFITED BY LOWER DITCH.] When a ditch or drain of a district has been located under the provisions of this Act, of sufficient capacity to carry off the water that flows into it, and also to properly drain the land assessed for the construction of the same, such land shall not again be assessed for the purpose of improving any lands of any drainage district lying above the lands so drained and assessed.

Sec. 66. OUTLET DRAINAGE DISTRICTS.] When any river or other

stream or watercourse in this State constitutes the common outlet for two or more drainage districts heretofore or hereafter organized under any of the laws of this State, and also constitutes the outlet for the drainage of lands not organized into a drainage district, and when it will be a benefit to the lands included in said drainage districts and to said lands not so included but having said river or watercourse as the outlet for drainage, for agricultural or sanitary purposes, that said river, watercourse or other stream or any portion thereof constituting such common outlet be deepened, widened or otherwise improved or that the channel thereof be changed or straightened, an outlet drainage district may be organized in the manner provided in this Act for the organization of drainage districts, and all lands benefited by so deepening, widening or otherwise improving or by changing or straightening the channel of such river or watercourse may be included within the boundaries of such outlet drainage district, and it shall not constitute any objection to the inclusion of any lands in such outlet drainage district that said lands had been therefore included in a drainage district organized under the general provisions of this Act, or under any other laws of this State. Commissioners of such outlet drainage district may be appointed at the time and in the manner and with the qualifications provided in this Act for the appointment of commissioners of drainage districts, and except as herein limited with like powers and duties. Special assessments may be levied on the lands or other property included in said outlet district, and which will be benefited by the improvements or other work proposed in said outlet district in the same manner as assessments for benefits are provided in levee and drainage districts organized under this Act, to pay the costs of constructing such improvement or other work, together with the cost of all proceedings therefor, but neither said outlet drainage district nor its commissioners or officers shall have any right to make any assessments against any of the lands included in said outlet drainage district for any purpose except to deepen or widen or otherwise improve the channel of said river or watercourse so constituting an outlet for the drainage of the lands included in said outlet drainage district or to change or straighten the channel thereof, nor to construct any other drainage work except to deepen, widen or otherwise improve the channel of such river or watercourse or to change or straighten the channel thereof: *And, provided,* that insofar as may be, except as herein limited and restricted, all the provisions of this Act with reference to drainage districts organized thereunder shall apply to an outlet drainage district so organized under this section: *And, provided, further,* that when it becomes necessary said outlet drainage district may acquire lands for right of way for an improvement constructed by it in the same manner as drainage and levee districts organized under this Act may acquire right of way and may so acquire said right of way either within or without the boundaries of an organized drainage district

theretofore organized: *And, provided, further*, that no outlet drainage district organized under this section shall remove, destroy, appropriate or use any levee, drain, ditch or art thereof, or other work of any drainage district organized under any laws of this State without paying such drainage district just compensation therefor. *And, provided, further*, that the inclusion of lands within an outlet drainage district which are not in any other drainage district, shall not, after the organization of such outlet district, prevent the formation of drainage districts under the general provisions of this or other Acts including such lands, nor their annexation to other drainage districts except outlet districts. In case the commissioners of said outlet drainage district and the corporate authorities of any such drainage district shall be unable to agree upon the compensation to be paid to such drainage district, the same may be ascertained and enforced by any proper proceedings in any court of competent jurisdiction. Upon payment of such compensation, said outlet district shall have the right to appropriate such levees, ditches, drainage or other work within the boundary of such outlet district for and in connection with the purposes for which said outlet district is organized.

Sec. 67. MUTUAL DRAINAGE DISTRICTS.] Owners of lands which require combined drainage and protection from overflow, may form drainage and levee districts, by mutual agreement, to include lands, of their own only, by an instrument in writing, duly signed and acknowledged and recorded in the drainage record. The mutual agreement may include the location and character of work to be done; the adjustment of damages; the amount of taxes to be levied; the apportionment thereof; how the work shall be done, or so much of these, or more, as may be agreed upon, and to this extent shall be as valid as though formed in the mode as hereinbefore provided, and may ask the judge of the County Court to appoint three commissioners whose powers and duties thereafter shall be the same as prescribed by other districts, and they shall commence acting at the point reached at the aforesaid agreement: *Provided*, that the said agreement may include the selection of three drainage commissioners from their own number or from others, and their terms of office shall be until the first Monday of September thereafter, or for this term and for one year in addition, as may be agreed at the time of their appointment, and at the annual meeting thereafter the majority of the land owners may choose, by ballot, three commissioners to serve, one for one year, one for two years, and one for three years from the date of appointment, and on the first Monday of each year thereafter the land owners may elect one commissioner of said district who shall hold his office for three years and until his successor is chosen and qualified. The powers and duties of the commissioners of a district by mutual agreement, and the mode and effect of special assessments, shall be the same as provided for other districts organized under this Act, and all the powers, rights and benefits of very kind given to drainage districts organized by petition to the

County Court shall be had by drainage districts organized by mutual agreement, and districts organized by mutual agreement may do as fully all work mutually agreed upon, as though surveys, plats and profiles, etc., were made and filed in said matter, and contracts for work to be done in said district may be let in parts, or the whole of said work may be let in one contract as is provided in this Act, as seems to be for the best interest of the parties concerned.

SEC. 68. **LAWFUL TO INCLUDE IN DRAINAGE DISTRICT ALL LANDS PROTECTED FROM INUNDATION, ETC.]** In the organization of drainage districts under this Act or former Acts where the works of the district include the construction of levees to protect the lands within said district from inundation and overflow, and the installation of a pumping plant, it shall be lawful to include within the boundaries of said district all the lands protected from inundation and overflow and all lands benefited by reason of the construction of levees, and the installation of said pumping plant, regardless of whether or not any of said lands are included within the boundaries of any other district organized under the laws of the State of Illinois, the works of which district consist only of ditches and drains and do not include the construction of levees and the installation of pumping plants.

SEC. 69. **REORGANIZATION OF OTHER DISTRICTS UNDER THIS ACT.]** Whenever a petition, signed by the owners of lands situated in any drainage district organized under any unrepealed law of this State, equal in number to one-fifth of the adult owners of lands in such district, shall be presented to the town clerk of the township in which the lands of such district, or a major part thereof lie, or the commissioners of any drainage district not under township organization, praying to submit the question whether such district will become organized as a drainage district under this Act, to the decision of the adult owners of lands in such district, it shall be the duty of the town clerk, or such commissioners, to submit the same accordingly; and to fix the time and place within such district for holding such election and make a record thereof; and to appoint the three judges to hold such election; and to give notice of the time and place and purpose of such election, by causing at least five notices thereof to be posted in public places in such district, for at least fifteen days prior to holding such election. Each owner residing within or out of such district shall have the right to cast a ballot at such election, with the words thereon, "for organization under the Revised Levee Act," or "against organization under the Revised Levee Act;" the judges of such election shall be sworn as required by law in force concerning State and municipal elections, and shall make returns of the poll-books of such election, as soon as practicable, after the election is held, to the clerk of the County Court of the county in which such district or the greater part of the land thereof is situated. The clerk of the County Court to whom such returns have been made, shall canvass such returns and cause a

statement of the result of such election to be entered of record, and if a majority of the votes are "for organization under the Revised Levee Act," the officer canvassing such returns, shall send a certified copy of such record to the town clerk, or other officer having in his custody the records of such district, whose duty it shall be to file and record such certified copy of the result of such election, in the drainage record of such district; and such district shall, from thence forth, be deemed to be duly incorporated as a drainage district, under this Act, and all further proceedings and work of such district shall, thereafter, be in the manner provided by this Act, but the officers of such district then in office shall continue as like officers of such district, until their successors shall be appointed and qualified under the provisions of this Act. It shall be the duty of the drainage commissioners, treasurer and other officers of any drainage district, whose terms of office expire, by reason of adopting the organization under this Act, or whenever a successor or successors to any or either of the officers provided by this Act shall have been appointed and qualified, to transfer and deliver all moneys, books and papers appertaining to his office, to such successor or successors in office.

REPEAL AND SAVING.

Sec. 69½. The following Acts are hereby repealed:

"An Act to provide for the construction, reparation and protection of drains, ditches and levees, across the lands of others for agricultural, sanitary and mining purposes, and to provide for the organization of drainage districts," approved and in force May 29, 1879, and all amendments thereto."

"An Act to authorize certain drainage and levee districts to organize, maintain and operate dredge boats for the construction and preservation of drains, ditches and levees," approved and in force May 16, 1905.

Sec. 70. The provisions of this Act so far as they are the same as those of existing statutes, shall be construed as a continuation thereof, and not as a new enactment, and a reference in a statute which has not been repealed, to provisions of the law which have been revised and re-enacted herein, shall be construed as applying to such provisions as so incorporated in this Act.

The repeal of a law by this Act shall not affect any Act done, ratified or confirmed, or any right accrued or established, or any penalty incurred under the provisions of such law.

Sec. 71. If any clause, sentence, paragraph or part of this Act shall be adjudged by any court of competent jurisdiction to be invalid or unconstitutional, such judgment shall not affect, impair, invalidate or nullify the remainder of this Act, but the effect thereof shall be confined to the clause, sentence, paragraph, or part thereof immediately involved in the controversy in which such judgment or decree shall be rendered.

Sec. 72. All drainage districts in process of organization or exercising any functions under any law repealed herein shall proceed under the provisions of this Act as a continuation of said repealed law saving all rights as provided in Section 70 herein.

In the several counties, courts of record now having jurisdiction of drainage districts shall retain jurisdiction under this Act. The records of drainage districts organized before justices of the peace, shall, together with a transcript of the docket of such justices relating to said districts be transmitted to the county court of the same county and all future proceedings in such districts shall be had in such county court.

CROSS-REFERENCE TABLE OF SECTION NUMBERS IN THE REVISED LEVEE
ACT AND OLD LEVEE ACT

The following table has been prepared for the convenience of those who wish to make a detailed comparative study of the Old Levee Act and the proposed Revised Levee Act. The first and third columns list in numerical order the section numbers in the Revised Act and the Old Act respectively. The second and fourth columns give the corresponding section numbers in the Old Act and the Revision respectively.

Revised Act	Old Act	Old Act	Revised Act
2	2	2	2
3	3	3	3
4	4—Cir. Ct. Act	4	4
5	5	5	5
6	Omitted, but see 46, 47, and 48.	6	46
7	9	7	47
8	10	8	48
9	11	9	7
10	12	10	8
11	13	11	9
12	14	12	10
13	15	13	11
14	16	14	12
15	16	15	13
16	16	16	14
17	17	16	15
17	17	16	16
18	55	17	16
18½	17a	17½	17
19	17b-18	17a	41
20	26	17b	18½
21	31	18	19
22	27	26	26
23	29	27	22
24	30	28	53
25	33	29	23

Revised Act	Old Act	Old Act	Revised Act
26	34	30	24
27	35	31	21
28	34a	32	51
29	34½	33	25
30	38	34	26
31	64	34a	28
32	44a	34½	29
32½	44	35	27
33	39	36	34
34	36	37	36-37
35	72	38	30
36	37	39	33
37	37	40	60
38	60	41	50
39	61	42	52
40	61	43	Omitted
41	17½	44	32½
42	26½	44a	32
43	58	45	54
44	58a	46	55
45	59	47	49
46	6	48	Omitted
47	7	49	Omitted
48	8	50	59
49	47	51	65
50	41	55	18
51	32	56	56
52	42	58	43
53	28	58a	44
54	45	59	45
55	46	60	38
56	56	61	39-40
57	57	62	61-62
58	Ind. Act	63	Omitted
59	50	64	31
60	40	65	69
61	62	65a	66
62	62	66	63
63	66	67	64
64	67	68	Omitted
65	51	69	Omitted
66	65a	70	Omitted
67	75	71	Omitted
68	78	72	35
69	65	72a	Omitted
		72	Omitted
		73	Omitted
		74	Omitted
		74½	67
		78	68

PART IV—STATE AID

By G. W. PICKELS

CHAPTER XXXVI—THE QUESTION OF STATE AID

This study of drainage conditions in Illinois discloses the fact that 1,326,260 acres along the streams of the State are subject to overflow for which no provision is being made. Of this amount, 199,500 acres are in organized drainage districts, but because of inadequate plans on the part of the districts, this area is in little better condition than the lands outside. The total represents 3.7 per cent of the entire area of the State.

No attempt is made to cultivate a large part of this land, and that which is farmed yields crops only from 10 to 65 per cent of the time, with an average of about 25 per cent. If accurate records were kept, it would be found that most of the farmers of unreclaimed bottom lands are losing money.

The soil is extremely fertile and produces abundant crops when it escapes overflow during the growing and harvesting seasons. While the land along some of the streams is better than that along others, yet in most instances the bottom land soil is the best in its community, having been formed by the erosion and deposition of the rich top soil of the tributary area.

This practically waste land represents one of the greatest, if not the greatest, undeveloped natural resource of the State; for mineral and other natural resources are exhaustible in time, but the wealth which lies in the fertility of the soil, if scientifically farmed, is inexhaustible. The soil is a veritable gold mine and in the last analysis is the source of the greatest part of our national wealth. Every individual in a nation is benefited directly or indirectly by the prosperity of the nation as a whole. Similarly, every citizen in the State of Illinois who has the interest of the State at heart, should be concerned in the higher development of its natural resources, and the reclamation of the overflowed lands should receive the attention which its importance merits.

Three parties will be directly benefited by the reclamation of these areas: First, the owners of the land who will receive the largest share of the profits from the land; second, the county in which the land is located, which will receive more revenue not only because of the increased valuation of the land but also because of the increased returns from it; and third, the State, which will be benefited in the same way as the county, but to a less degree. These benefits can be expressed in direct monetary terms.

Although indirect benefits cannot be measured in dollars, they are many and far reaching.

The communities which contain large areas of overflowed lands are the

most backward in the State from the standpoint of social, educational, and industrial development, as the natural result of frequent isolation and the lack of good lines of communication. The reclamation of the bottom lands means better facilities for transportation and educational, social, and political advancement. At present in a number of valleys like the Kaskaskia and Embarrass, the bottom roads are impassable for weeks and months at a time except on horseback; and during extreme flood periods, railroad traffic is delayed and occasionally stopped. The writer fears that the construction of the State-aid roads across these valleys is being planned without adequate thought as to the future improvements in the channels of the streams. One of the first steps in bottom land reclamation is the straightening of the crooked streams, and if the State constructs permanent bridges over the present channels, they will seriously interfere with future channel improvements. It would seem that the two problems should be studied at the same time and plans evolved which probably would be satisfactory to both interests. It is said that some of the county superintendents of highways have brought this matter to the attention of the State highway officials, but that thus far the matter has been given little consideration.

At present a large part of the 1,326,260 acres of overflowed land is non-productive; but if protected from the flood waters and drained, it would raise as abundant crops as any land in the State. Certainly it would seem a good investment on the part of the land owners to reclaim it. Large areas have already been reclaimed with considerable profit to their owners, and many projects are now being promoted to redeem tracts, which are so situated that they can be handled independently. The cost of reclamation will vary of course with natural local conditions, but there are few cases in which two or three crops from the land will not pay for the improvement.

The question naturally arises as to why all of this land has not been reclaimed, since the investment is a profitable one. The answer is that in the smaller valleys the stream channels must be straightened first to permit the flood water to run off faster and to provide outlets for the drainage of the land. This under present law means the coöperation of the majority of the owners or the owners of the majority of the land, which is rather difficult to secure for various reasons. Some own high land as well as bottom land and are not particularly concerned with the latter areas, which they bought along with the higher land and at small cost; some feel that the improvements are prohibitive in cost and that the State should pay part of it; others are opposed to improvements of any kind, and look upon floods as necessary evils to be endured rather than corrected; but there are still others who are more broad-minded and progressive and who see the possibilities of the situation and are anxious to develop them.

In many areas the owners are willing to pay their share of the cost

of reclamation, but are not willing to engage in the promotional work necessary to organize projects of this kind.

Along the middle and lower reaches of many streams the flood conditions are worse than they were formerly, due to the large amount of artificial drainage work which has been done in the prairie areas at the upper ends of the watersheds. Some lands which were formerly cultivated are now covered with trees because of this fact. Some owners feel, with some justification, that since the State, through its drainage laws, has permitted such a large amount of artificial drainage to be done to the detriment of the lower lands, it should assist in remedying the situation by opening up the river channels.

Whether or not the State should bear any part of the cost of channel improvement is a matter upon which the writer is not prepared to express an opinion; but since the State will be benefited directly through increased revenue from the land and indirectly through the increased wealth of a portion of its citizens and the more rapid improvement of these several communities, it certainly should be interested in the matter and should do all that it reasonably can toward bringing about the reclamation of this large aggregate area of land which is now unproductive.

The assistance which the State might quite properly give in this work is of a threefold nature: educational, investigational and legislative.

EDUCATIONAL ASSISTANCE

One of the serious obstacles which is delaying the reclamation of this land is the opposition of the more conservative land owners who, not understanding the processes and economical advantages of reclamation, are standing in their own light and making it very discouraging for the more enlightened owners who realize that they are losing money every year that the bottom land remains in its present condition.

A state educational campaign in the river valleys concerned would largely remove this obstacle, since the reclamation of these lands can be shown to be an excellent business investment if carried out on a comprehensive scale and in accordance with sound engineering principles. Such a campaign might include:

1. The preparation of pamphlets explaining (a) the engineering features of such projects, (b) the best method of financing their construction so as to make the profits from the land itself pay for its reclamation, and (c) the financial benefit to the owners of the land.
2. Illustrated lectures delivered through the areas concerned, showing the results of land reclamation which has already been accomplished, and giving facts and figures in connection therewith.

In carrying out both suggestions, the cooperation of the County Farm Advisers should be sought. These men are all interested in the bottom land problem and undoubtedly will be glad to render all possible assistance.

INVESTIGATIONAL ASSISTANCE

The construction works necessary for the reclamation of the bottom land along the larger streams consist of :

1. The straightening and cleaning of the river channel to provide the best outlet obtainable under existing conditions.
2. The building of levees to keep out the flood waters.
3. The dredging of diversion ditches, when needed, to carry the hill waters around the leveed areas.
4. The dredging of interior ditches to collect the rain and seepage water.
5. The construction of a gravity outlet ditch or a pumping plant for removing the water from the leveed areas.
6. The laying of small drain tile for the thorough drainage of the land ; this to be done individually.

The first of these items must be carried out for the entire valley, from the mouth of the stream as far upstream as the overflow conditions warrant the necessary expenditures. It cannot be done successfully piecemeal, since the improvement of an intermediate stretch cannot be intelligently planned without taking into consideration the various watershed characteristics both above and below the stretch in question ; and even if a complete study is made and a comprehensive system planned and only a portion of the improvement is constructed, its operation will not be entirely successful, because it will be out of adjustment with the areas above and below.

The levees must also be planned as a unit, though it is not so essential from the operating standpoint that all the required levees be constructed in one operation. However, it is in the interest of economy to do so.

The third, fourth, fifth, and sixth items previously enumerated can be carried out locally at any convenient time and with any desired degree of completeness.

However, it is seen that the improvement of the channel and the construction of levees require the coöperation of all the bottom land-owners along the stream. It is very difficult to secure signatures to a petition to form a district of this kind unless the signers have rather definite information as to the nature of the improvement, how it will affect their lands, what the approximate cost will be, and what preliminary expenses they will be called on to pay. In ordinary drainage districts it is not a difficult matter to determine the location and extent of the ditches with sufficient accuracy to prepare a general description of such work as is required by law to be contained in the petition ; but for a district embracing an entire river valley, a large amount of engineering work must be done before it is possible to prepare such a petition. This means a considerable amount of money must be raised for preliminary expenses, whereas few men would care to guarantee such expenses on so

uncertain a proposition. State assistance in making plans and estimates might well be given.

Again, in straightening the channel of a stream, all changes should be planned on engineering and economic lines, so as to secure the best results for the valley as a whole, and the wishes of individual owners, who are naturally biased in their views, should not have undue weight. Hence the plans for such improvements should be made by disinterested parties. Furthermore, before intelligent plans can be made for comprehensive channel improvement, and location and design of levees, it is necessary to have as definite information as possible in regard to the amount and distribution of the water which will have to be carried in the channel and between the levees during the flood periods. To obtain this information, scientific investigation is necessary. This again suggests State assistance.

This work of scientific investigation consists of:

1. Mapping the watershed area under consideration. The quadrangle maps of the State Geological Survey are satisfactory for the upland portions of the watersheds, but for the immediate valleys of the main streams larger scale maps are required. These have already been made for portions of some of the streams.

2. The establishing of many more gaging stations for measuring the run-off from various portions of the several watersheds.

3. A study of the water supply and sewage-disposal needs of the cities and towns along the streams, so that the best interests of all the people may be served.

Because of the large amount of upland drainage which has been done, and the consequent lowering of the water table, the summer flow of our streams is much less than formerly. Drainage has increased the flood flow and decreased the low-water flow. While there are times when the rain water should be removed from the land as rapidly as possible in order to prevent crops from being drowned out, there are other times when the rapid removal of the flood water is not necessary, and some plan should be devised for regulating the flow, so that those on the lower end of a stream would not be injured unnecessarily. Such regulation, if extended to the tile drains, would prevent too low a water table during the drought periods, and increase the summer flow of the stream. This is a matter which has been given little, if any, attention. But its importance warrants careful investigational study.

After all the necessary data have been obtained, general plans, estimates, and recommendations should be prepared, and dignified promotion of the enterprise be undertaken.

Whether or not the State should pay any part of the cost of channel correction is an open question. Certainly it should not go any farther than this. However, there is precedent in other States for indirect financial aid, which after a term of years is returned to the State.

It is almost imperative that some form of organization other than that now possible be provided for so large an undertaking. Possibly an act somewhat similar to that for the organization of sanitary districts, where large numbers of people are concerned, might apply in this case.

It is the opinion of those making this investigation, that once the channels are opened up, a large amount of local levee and drainage work will be done. To facilitate this, the drainage laws should be revised, so that when the land-owners want to organize they can do so without the delay and unnecessary expense which have characterized such organizations in the past.

LEGISLATIVE ASSISTANCE

As stated in Chapter I, about 114 amendments have been made to the drainage laws since 1878. As a result of this large amount of "patching," the present law is illogically arranged, contains certain sections which have been declared unconstitutional by the courts and certain other sections which are detrimental to the best interests of drainage districts. At no time has the law been revised as a whole, and consequently there is a considerable need at present for such a revision.

As part of this investigation the drainage laws of Illinois and other States have been studied, the opinion of leading drainage attorneys has been sought, and a "Revised Levee Act" has been drafted, which would greatly simplify the organization of districts. This proposed law has already been given in Chapter XXXV.

The State can assist drainage reclamation by passing the proposed law.

